EAGLE GOLD PROJECT

HEAP LEACH FACILITY OPERATION, MAINTENANCE AND SURVEILLANCE MANUAL

Version 2019-01

FEBRUARY 2019

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

List of Tables

List of Figures

THIS PAGE INTENTIONALLY LEFT BLANK

1 INTRODUCTION

This Operation, Maintenance and Surveillance (OMS) Manual for the Heap Leach Facility (HLF) was prepared by StrataGold Corporation (SGC) for the Eagle Gold Project (the Project), which is located approximately 85 km from Mayo Yukon. The OMS Manual will be used in the training of all operators and maintenance personnel with responsibilities related to the HLF. It also includes guidance on emergency response procedures but should be reviewed in conjunction with the following documents:

- The Heap Leach and Process Facilities Plan;
- The Cyanide Management Plan; and,
- The Heap Leach and Process Facilities Emergency Response Plan.

The OMS Manual provides a framework for actions and a basis for measuring performance and demonstrating due diligence for the HLF operations. Key items and activities covered in this Manual include the following:

- Roles and responsibilities of personnel assigned to OMS activities for the HLF;
- Description of the HLF including site conditions, key components, regulatory requirements, and design criteria;
- Facility operations including ore stacking, leaching, in-heap solution management, solution processing, environmental protection, and documentation and reporting;
- Facility maintenance including routine and event-driven maintenance, and documentation and reporting;
- Facility surveillance including routine, event-driven and annual comprehensive inspections and documentation and reporting.

This OMS Manual presents procedures that will be implemented by appropriate mine personnel for the operation, maintenance, and surveillance of the HLF to ensure that it is functioning as designed; meets regulatory and corporate environmental policy obligations; and assists in minimizing the potential for environmental degradation to occur.

2 MANAGING CHANGE

The HLF OMS Manual will be reviewed and updated as required by the Process Plant Manager in accordance with Eagle Gold Operating Procedure SGC-CMP-SOP-001 “Preparation, Review, Approval, Update, Controlled Distribution of Eagle Project Management Plans and Standard Operating Procedures”.

When updated, the Manual will be reviewed by the Mine General Manager and the Vice President responsible for Environment, Health and Safety. Manual revisions may incorporate changes in facility performance, capacity, operational requirements, closure requirements, site management, roles and responsibilities, or regulations or reporting procedures.

As the Project advances through construction and operations, any previous versions of the Manual will serve as a record of construction and operation of the HLF, and will be accessible to all persons operating the facility, the Design Engineer and regulatory authorities. Tables 2.1-1 summarize the Manual revision history.

Version 2019-01 of the HLF OMS Manual for the Project has been revised in February 2019 to update Version 2014-01. Table 2.1-2 is intended to identify modifications to the Manual and provide the rationale for such modifications.

The list of Manual holders for the HLF is provided in Table 2.1-3. SGC will maintain a record of the location of each copy of the Manual and will ensure that all copies are updated when required.

Table 2.1-1: OMS Manual Revisions History

Revision Number	Details	Issue Date
Version 2014-01	Initial OMS for HLF. Presents the proposed facility design; operation, maintenance and surveillance activities; from construction through reclamation and closure.	April 2014
Version 2019-01	Revised to reflect HLF design improvements, and address conditions of QML-0011 and WUL QZ14-041.	February 2019

Table 2.1-2: Version 2019-01 Revisions

Section	Revision/Rationale
1 Introduction	▪ Text revisions to describe the purpose of the document and the supporting plans that should be considered in conjunction with the HLF OMS Manual.
2 Managing Change	▪ Inclusion of reference to relevant SOP for review and updates to the Manual. ▪ Inclusion of revision history information. ▪ Inclusion of list of manual holders.
3.1 Assignment of Responsibilities	▪ Minor text revisions for readability. ▪ Inclusion of specific responsible personnel. ▪ Updates to position titles for consistency with SGC organizational structure. ▪ Revision to personnel responsible for execution of certain duties. ▪ Inclusion of OMS Responsibility Organizational Chart.
4.1 Ownership	▪ Text revisions to reduce repetition and improve readability.
4.2 Site Overview	▪ Text revisions to reduce repetition and improve readability. ▪ Update to mineral reserve. ▪ Update to summary of project schedule.

Section	Revision/Rationale
4.3 HLF Overview	▪ Text revisions to describe issued for construction design of HLF. ▪ Inclusion of discussion on HLF monitoring systems as required by regulatory approvals. ▪ Updates to figures depicting various HLF components.
4.4 Site Conditions	▪ Minor text revisions to discussion of site conditions based on results ongoing data collection.
5 Regulatory Requirements	▪ Text revisions to reflect the status of the Project with respect to regulatory approvals. ▪ Updates to the design standards adopted for the Project.
6.1 Design Requirements	▪ Minor text revisions for readability and to reference updated CDA Guidelines.
6.2 Design Basis	▪ Reference to updated CDA Guidelines. ▪ Revisions to describe updated analyses for the issued for construction design. ▪ Reference to design criteria required by the regulatory approvals.
6.3 Engineering Design Criteria	▪ Revisions to criteria for the issued for construction design for consistency with design and regulatory approval requirements.
7 Heap Leach Facility Operations	▪ Revisions to describe issued for construction design. ▪ Updates to figures depicting facility elements.
7.1 Pad Loading	▪ Inclusion of lime addition rates ▪ Inclusion of ore placement considerations. ▪ Updates to be consistent with issued for construction design.
7.2 Ore Stacking Plan	▪ Updates to figures showing development of ore stack for each phase of the Project.
7.3 Solution Delivery and Leaching	▪ Inclusion of greater detail on solution delivery and leaching process. ▪ Reference to HLF Contingency Water Management Plan. ▪ Inclusion of definitive events pond triggers as required by regulatory approvals.
7.4 Heap Leaching Cycle	▪ Update to heap leaching cycle based on issued for construction design and current schedule.
7.5 Cold Weather Considerations	▪ Minor text revisions for readability. ▪ Revisions to describe issued for construction design.
7.6 Leachate Collection System	▪ Minor text revisions for readability. ▪ Revisions to describe issued for construction design.
7.7 Leak Detection and Recovery System	▪ Minor text revisions for readability.
7.8 Events Pond	▪ Revisions to describe issued for construction design. ▪ Reference to HLF Contingency Water Management Plan.

Section	Revision/Rationale
8 Heap Leach Facility Maintenance	▪ Minor text revisions for readability. ▪ Updates to position titles for consistency with SGC organizational structure.
8.1 Routine Maintenance	▪ Minor text revisions for readability. ▪ Inclusion of monitoring of pipeline corridors. ▪ Update to HLF maintenance work management process flowchart.
8.2 Event Driven Maintenance	▪ Minor text revisions for readability. ▪ Reference to HLF Contingency Water Management Plan.
9 Heap Leach Facility Surveillance Response	▪ Text revisions to better describe surveillance methods. ▪ Inclusion of specific position responsibility for surveillance of HLF ▪ Inclusion of additional surveillance areas as required by regulatory approvals.
9.1 Routine Inspections	▪ Inclusion of greater detail on routine inspections and additional areas to be inspected. ▪ Clarification of responsibility for certain inspections.

9.2
Instrumentation, Monitoring and Response
	▪ New section to meet regulatory approval requirements for:
	  ▪ monitoring of fluid levels;
	  ▪ in-heap pond triggers and responses to those triggers;
	  ▪ events pond triggers and responses to those triggers;
	  ▪ protocols for allowing storage of water in the Events Pond; and,
	  ▪ protocols for comparing observed leakage rates and LDRS alert levels.
	▪ Inclusion of movement monitoring.
	▪ Inclusion of seepage/underdrain monitoring.

9.3 Annual Inspection - Engineer of Record or Designate	▪ Minor text revisions to clarify responsibility.
9.4 Annual Physical Stability Inspection - Independent Engineer	▪ Inclusion of annual third-party physical stability inspection as required by regulatory approvals.
9.5 Event-Driven Inspections	▪ Inclusion of reference to additional HLF related Plans.
9.6 Comprehensive Dam Safety Review	▪ Inclusion of comprehensive dam safety review as required by regulatory approvals.
9.7	▪ Minor text revisions for readability.

Section	Revision/Rationale
Data Interpretation and Documentation	
9.8 Reporting	▪ Updates to position titles for consistency with SGC organizational structure.

Table 2.1-2: List of Manual Holders and Contact Information

Manual Copy No.	Name	Organization and Title	Email address	Telephone Number
1	Mark Ayranto	Victoria Gold Corp. Chief Operating Officer	mayranto@vitgoldcorp.com	604-696-6614
2	David Rouleau	Victoria Gold Corp. Vice President - Operations	drouleau@vitgoldcorp.com	604-696-6621
3	David Rouleau	Victoria Gold Corp. Mine General Manager	drouleau@vitgoldcorp.com	604-696-6621
4	Barry Carlson	Victoria Gold Corp. Process Manager	bcarlson@vitgoldcorp.com	720-642-9322
5	TBD	Victoria Gold Corp. Health, Safety and Security Manager		
6		Yukon Government - Energy, Mines & Resources		867-667-3111
7		Yukon Water Board	ywb@yukonwaterboard.ca	867-456-3980

3 ROLES AND RESPONSIBILITIES

This section identifies the individuals having responsibility for the operation, maintenance and surveillance of the HLF. Responsible parties for employee training and managing HLF change procedures are also identified.

3.1 ASSIGNMENT OF RESPONSIBILITIES

The main individuals responsible for the HLF OMS are the Process Manager and the Mine General Manager. Certain SGC Project and corporate personnel will also support the onsite operations. As necessary, additional support will be provided by outside engineering firms as appropriate. Communication with key external stakeholders, being the First Nation of Nacho Nyak Dun, Yukon Government Department of Energy, Mines and Resources, the Yukon Water Board and local authorities, will occur as appropriate.

Figure 3.1-1 presents an organization chart that shows reporting links within the organization and communication links to external organizations.

Personnel responsible for OMS activities and emergency preparedness and response are listed in Table 3.1-1. Contact information for these key individuals is provided in Table 2.1-2 of this Manual.

Table 3.1-1: HLF OMS Personnel and Responsibilities

Title	Name	Corporate	Operations	Maintenance	Surveillance	Emergency Preparedness	Training	Change Management
Chief Operating Officer	Mark Ayranto	x	x					
Vice President of Operations	David Rouleau	x	x	x	x	x	x	x
Mine General Manager	David Rouleau		x	x	x	x	x	x
Process Manager	Barry Carlson		x	x	x	x	x	x
Process Operations Superintendent	TBD		x	x	x	x	x	x
Process General Foreman	TBD		x	x	x	x	x	
Process Supervisor	TBD		x	x	x			
Chief Metallurgist	TBD		x		x			
Maintenance Manager	Douglas Desaulniers			x	x	x		x
Maintenance Foreman	TBD			x	x			x
Maintenance Supervisors	Various			x	x			

Title	Name	Corporate	Operations	Maintenance	Surveillance	Emergency Preparedness	Training	Change Management
Senior Maintenance Planner	Mike Hissink			x	x			x
Maintenance Planners	Various			x	x			
Environmental Manager	Lindsay Rear				x	x	x	x
Environmental Coordinators	Katie Babin, Phil Emerson				x	x		
Health, Safety and Security Manager	TBD				x	x	x	x
Health and Safety Coordinator	TBD				x	x	x	

The Process Manager is responsible for all HLF and ADR Plant operations at the Project, including any decisions regarding the procedures to be carried out during an emergency. Crushing and Conveying General Foreman are responsible for conducting daily inspections and monitoring of the placement of the ore on the Heap Leach Pad. The Process General Foreman is responsible for the day-to-day operation of the Process Plant, including regular maintenance and monitoring requirements. The Process Operations Superintendent is responsible for ensuring that daily and monthly reports for maintenance, inspection and monitoring of the HLF are prepared. The Environmental Manager is responsible for monitoring and managing the various territorial and federal environmental permits, licenses and regulations. In the event that these individuals are not available, the responsibility is then delegated to a designate.

In addition, all site personnel and visitors on project business are requested to be vigilant of visual indications of faulty performance of all aspects of the facility.

3.2 TRAINING

The Process Department will provide routine training workshops for all personnel with OMS responsibilities for the HLF. The workshops will focus on the operation, maintenance, surveillance, emergency response, and regulatory reporting requirements for the HLF. Engineering consultants who are familiar with the HLF design and operations will assist with the training program as needed.

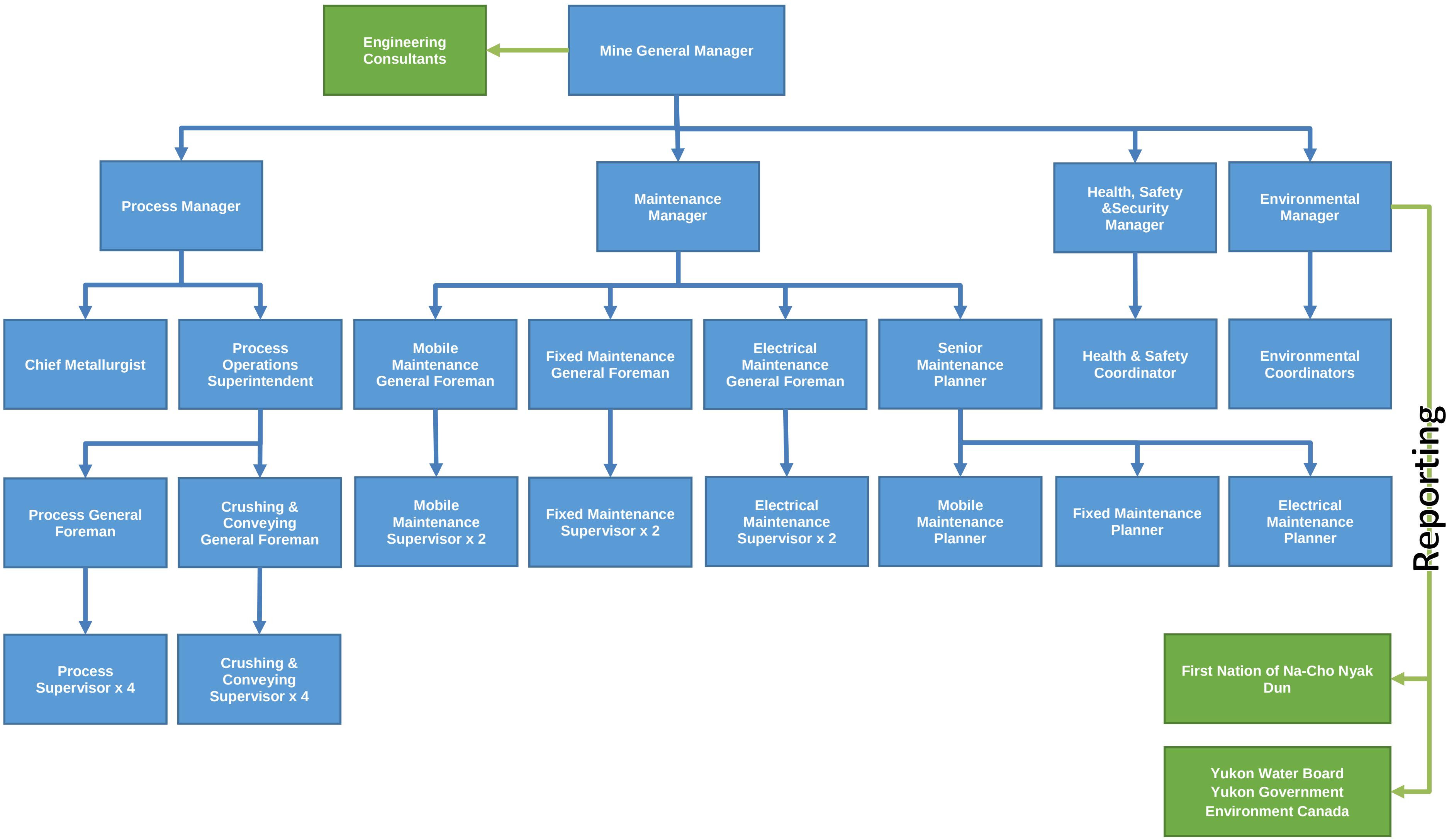


Figure 3.1-1: OMS Responsibility Organizational Chart

4 PROJECT OVERVIEW

4.1 OWNERSHIP

SGC is the owner of the Project. SGC is a directly held-wholly owned subsidiary of Victoria Gold Corp. (VGC). The company head office is located in Toronto, ON with regional offices in Vancouver, BC and Whitehorse, YT. The Project is located within SGC's 100% owned Dublin Gulch Property. This Project Figure 4.1-1 illustrates the general Project location, while Figure 4.1-2 illustrates the Project site, including all facilities and components.

4.2 SITE OVERVIEW

The Project is an open pit gold mine and heap leach operation. As illustrated by Figure 4.1-1, it is located in the central Yukon Territory, approximately 400 km north of the capital Whitehorse, and 45 km (85 km by road) north-northeast of the Village of Mayo, the closest community with significant commercial services. The Project site is located within the Mayo Mining District.

The Project site can be accessed year-round from Mayo by following Highway 2 for 35 km, then heading along the South McQuesten Road for 21 km. The last 25 km are public but user-maintained, which are generally in good repair and allow passage for cars, trucks, and heavy haul highway truck and trailer units.

This Project focuses on the Eagle Zone portion of the Dublin Gulch Property, which contains a Probable Mineral reserve of 116 Mt, with a diluted grade of 0.66 g/t Au (JDS 2016). The Project is based on a conventional open pit mine; ore will be mined and processed at a rate of 29,500 t/d over the LOM. Ore will be crushed using three stages of conventional crushing, and then heap leached to produce saleable gold doré.

Full operations are planned to begin in the second half of 2019 and last to 2029. Concurrent reclamation of specific facilities no longer required for operations will be completed during normal mine operations. Under the current mine plan, final reclamation and closure of the Project site will be initiated after all economic precious metal values have been recovered from the HLF. Final reclamation and closure is scheduled to commence in 2029. Post closure monitoring of the Project site, including the HLF, will occur for an estimated 5 years depending on the facility, closure objectives and when close criteria are met.

A complete site layout drawing is provided by Figure 4.1-2.

4.3 HLF OVERVIEW

The HLF will be progressively developed in three phases: one phase during initial construction (pre-mining), and two phases during mining operations. The HLF will occupy an area of 106 ha and contain at least 86 MT of crushed ore at the end of the LOM.

The HLF is a valley fill design that incorporates a rock/earth fill embankment that will provide stability to the base of the heap and the stacked ore. The embankment also creates an In-Heap Pond leaching configuration that provides storage capacity for pregnant solution within the ore pore spaces and eliminates the need for downstream process solution ponds (Figure 4.3-1). The major design components for the HLF include the following: the embankment; a composite liner system; the In-Heap Pond; solution recovery wells; associated piping network for solution collection and distribution; a leak detection and recovery system (LDRS); and a downstream Events Pond to contain excess solution that results from extreme precipitation or emergency events.

The HLF pad will consist of two composite liner systems (Figure 4.3-2), the up-gradient liner system and the In-Heap Pond liner system. The single composite liner system in the upper portion of the pad (above the In-Heap Pond) will be comprised of a double-side textured 80 mil linear low-density, polyethylene (LLDPE) liner over a geosynthetic clay liner (GCL) system. The double composite liner system in the In-Heap Pond will be comprised of two discrete layers of LLDPE liner, separated by a layer of geonet material to form the LDRS, over a GCL system.

The In-Heap Pond (essentially a saturated zone within the lower extent of the HLF ore pile) at the spillway invert elevation of 938 m asl (i.e., with no freeboard left) will be able to contain up to 126,800 m^3 of solution within the pore spaces of the stacked ore. Typical In-heap Pond occupied operational volume will be about 52,200 m^3 (minimum volume and elevation to keep the sump full and prevent pump cavitation plus the gradation of moisture content above the operational level that would be expected under normal conditions), which is about 40% of the total capacity within the In-Heap Pond itself. Storage of PLS in the In-Heap Pond is a cold-weather mitigation and has the added benefit that PLS will not be exposed during normal operations.

Process (barren) solution containing cyanide will be applied to the ore via a drip irrigation system (buried during winter). The resultant PLS will be captured in the solution collection system and flow to the In-Heap Pond. The PLS will be recovered via a well system using pumps and standpipes. The PLS will be transferred to the ADR plant for gold recovery.

The heap leach pad is designed to contain a network of pipes that will be distributed throughout the limits of the facility at the base of the ore pile. This pipe network will collect and convey PLS and any infiltrated stormwater to the In-Heap Pond area where it will be pumped to the process plant via the solution collection wells. The pipe network was designed to accommodate stormwater volume from a 100-year, 24-hour storm event in addition to 150 percent of the design capacity of the anticipated PLS solution flow (150 percent PLS flow + 100-year, 24-hour storm event).

The downstream Events Pond (Figure 4.3-3) will serve as an overflow containment area that provides additional solution storage in case the In-Heap Pond capacity is exceeded. The Events Pond is sized to provide containment storage for the Probable Maximum Flood (PMF) Event assuming the In-Heap Pond solution storage is at maximum capacity. As designed, the Events Pond has an operational storage capacity of approximately 299,900 m^3 to the spillway invert at elevation 894.5 m. Inspection and monitoring systems are included in the HLF to assess the ongoing performance of the facility. The In-Heap Pond fluid levels are continuously monitored using a network of vibrating wire piezometers. The Events Pond fluid levels will be monitored visually with level gauges.

Liner Integrity will be monitored by regular inspection of the LDRS monitoring sumps for both the In-Heap Pond and the Events Pond. The HLF design includes an underdrain system for the collection and drainage of subsurface water beneath the lined facility to limit upward pressure on the HLF liner. The underdrain system will convey subsurface flows to a monitoring vault. The underdrain system provides some additional leak monitoring capability (as the underdrain header pipes are situated below the PLS header pipes where flows will be concentrated) and the underdrain monitoring vault will be regularly checked as an additional method of detection of measurable leakage through the liner system.

Embankment integrity is monitored using a network of survey monuments and inclinometers. Monitoring of the HLF also includes regular scheduled visual inspections and reporting programs, in addition to comprehensive third-party inspections in accordance with Canadian Dam Association, Dam Safety Guidelines.

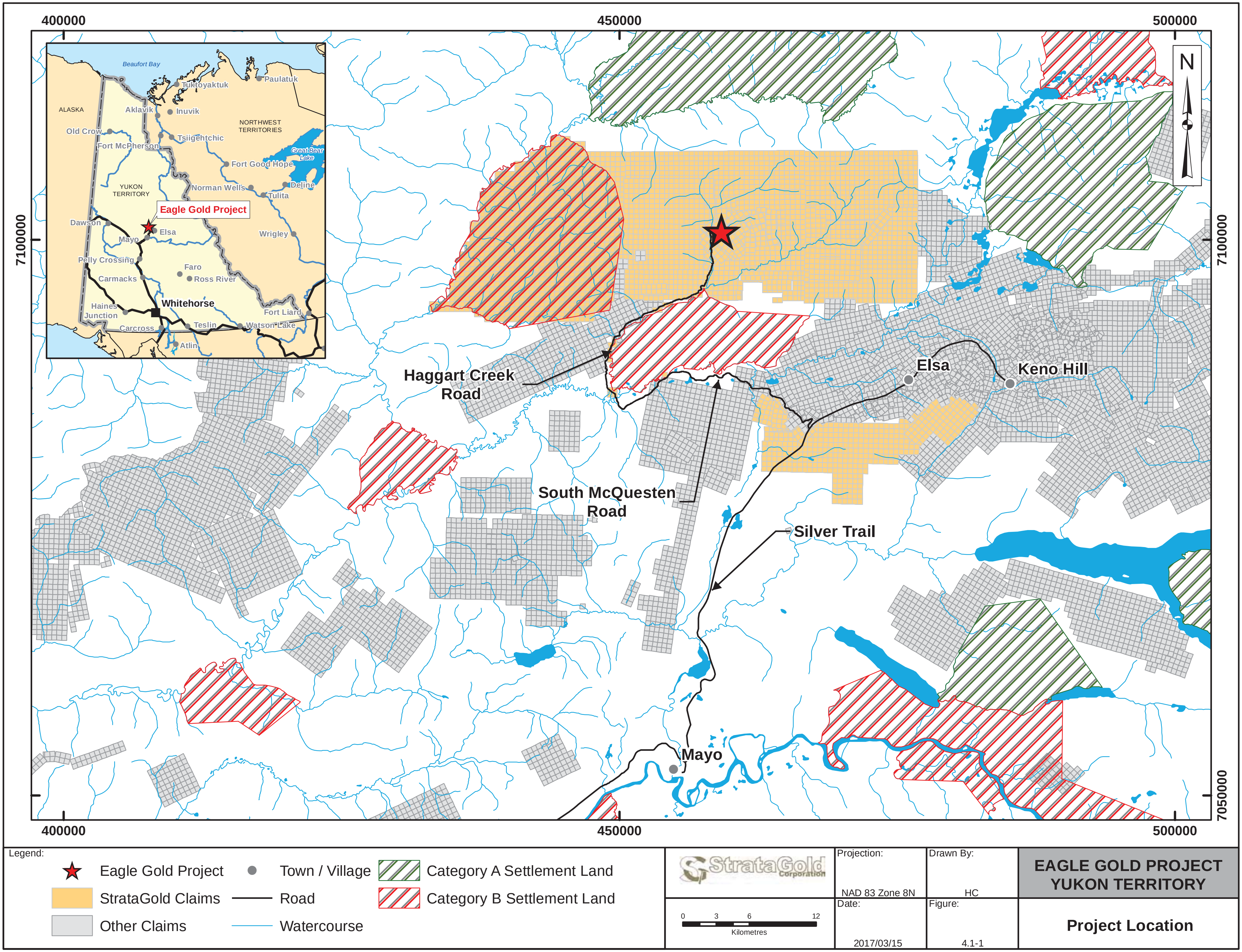
4.4 SITE CONDITIONS

The Project is situated within the Yukon Plateau North Ecoregion, in the Boreal Cordillera Ecozone which encompasses the Stewart, MacMillan and Pelly plateaus and southern part of the Selwyn Mountains.

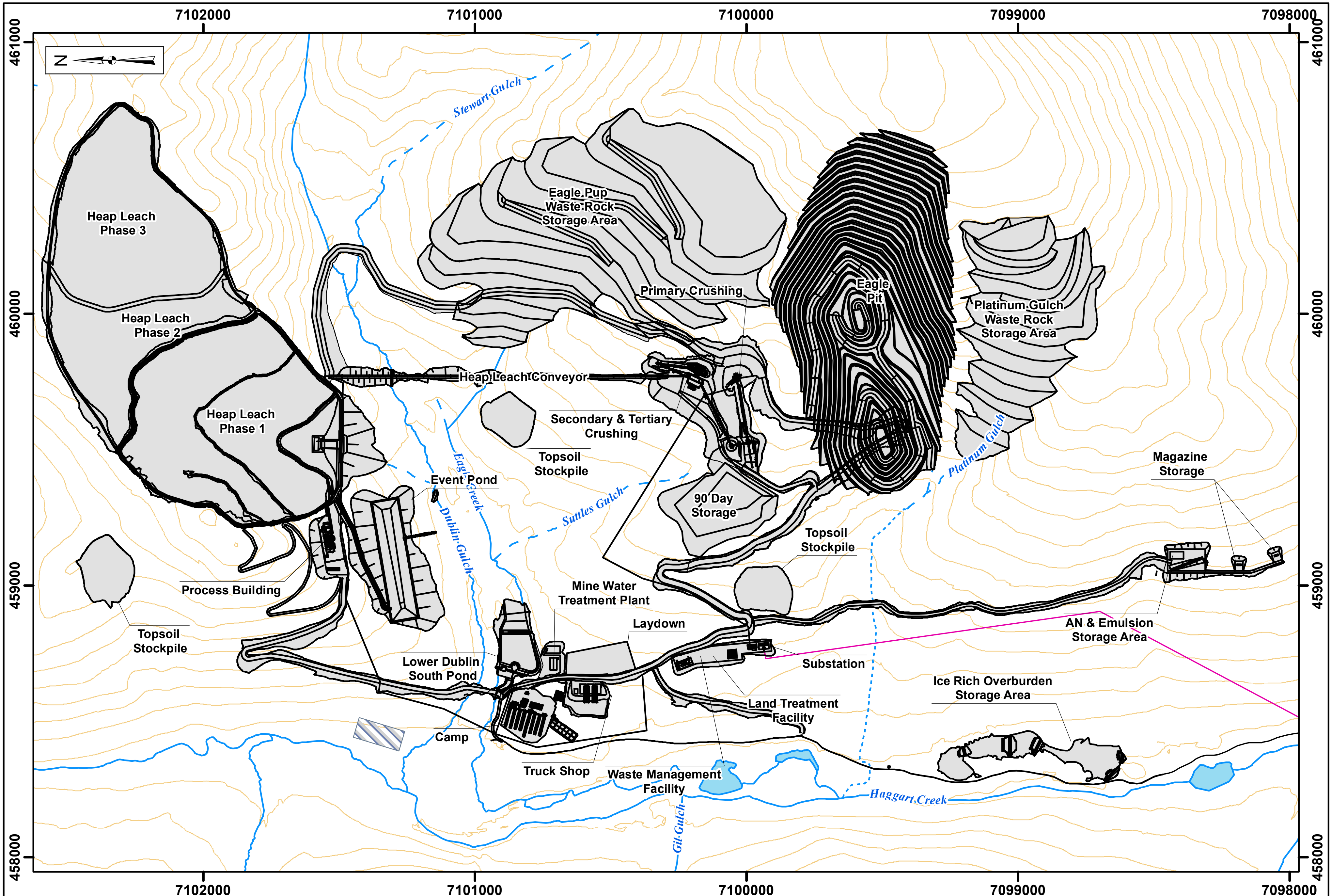
The Project area topography is characterized by rolling hills and plateaus ranging in elevation from approximately 765 masl near the confluence of Dublin Gulch and Haggart Creek, to 1,525 masl at the base of the Potato Hills which forms the eastern boundary of the Dublin Gulch watershed. The majority of the Project site lies within the Dublin Gulch watershed. The Dublin Gulch stream is a tributary to Haggart Creek which flows to the South McQuesten River within the Stewart River sub-basin of the Yukon River Watershed.

The ground surface within the Project area is covered by residual soil and felsenmeer. Outcrops are rare, generally less than two percent of the surface area, and are limited to ridge tops and creek walls. Lower elevations are vegetated with black spruce, willow, alder and moss, and higher elevations by sub-alpine vegetation. Patchy permafrost occurs on north-facing slopes.

The Project area has a northern continental climate which is characterized by moderate annual precipitation and a large temperature range. Summers are short and can be hot, while winters are long and cold with moderate snowfall. On an annual basis, total precipitation in the region is comprised of roughly 60% rainfall and 40 % snowfall noting proportions vary by elevation. For the component of annual precipitation realized as rainfall, roughly half of annual rainfall may be expected in June and July at the Project site. The mean annual temperature for the area (at the reference elevation of 1,125 m asl) is approximately -3.7°C (Lorax, 2017)



400000
450000
500000
7100000
7050000
N
Beaufort Bay
Tuktoyaktuk
Paulatuk
ALASKA
Aklavik
Inuvik
NORTHWEST TERRITORIES
Old Crow
Tsiigehtchic
Fort McPherson
Great Bear Lake
Fort Good Hope
YUKON TERRITORY
Norman Wells
Deline
Tulita
Eagle Gold Project
Dawson
Elsa
Mayo
Wrigley
Pelly Crossing
Faro
Carmacks
Ross River
Haines Junction
Whitehorse
Fort Liard
Carcross
Teslin
Watson Lake
Atlin
Haggart Creek Road
Elsa
Keno Hill
South McQuesten Road
Silver Trail
Mayo
Legend:
Eagle Gold Project
Town / Village
Category A Settlement Land
StrataGold Claims
Road
Category B Settlement Land
Other Claims
Watercourse
StrataGold Corporation
0 3 6 12
Kilometres
Projection:
NAD 83 Zone 8N
Drawn By:
HC
Date:
2017/03/15
Figure:
4.1-1
EAGLE GOLD PROJECT
YUKON TERRITORY
Project Location



Legend:

Facility	Perennial
EagleGold69kV_Lines	Ephemeral
Reserved Area	Intermittent
Waterbody	Contour (25m)

StrataGold Corporation

Projection: NAD 83 UTM Zone 8N

Drawn By: JK

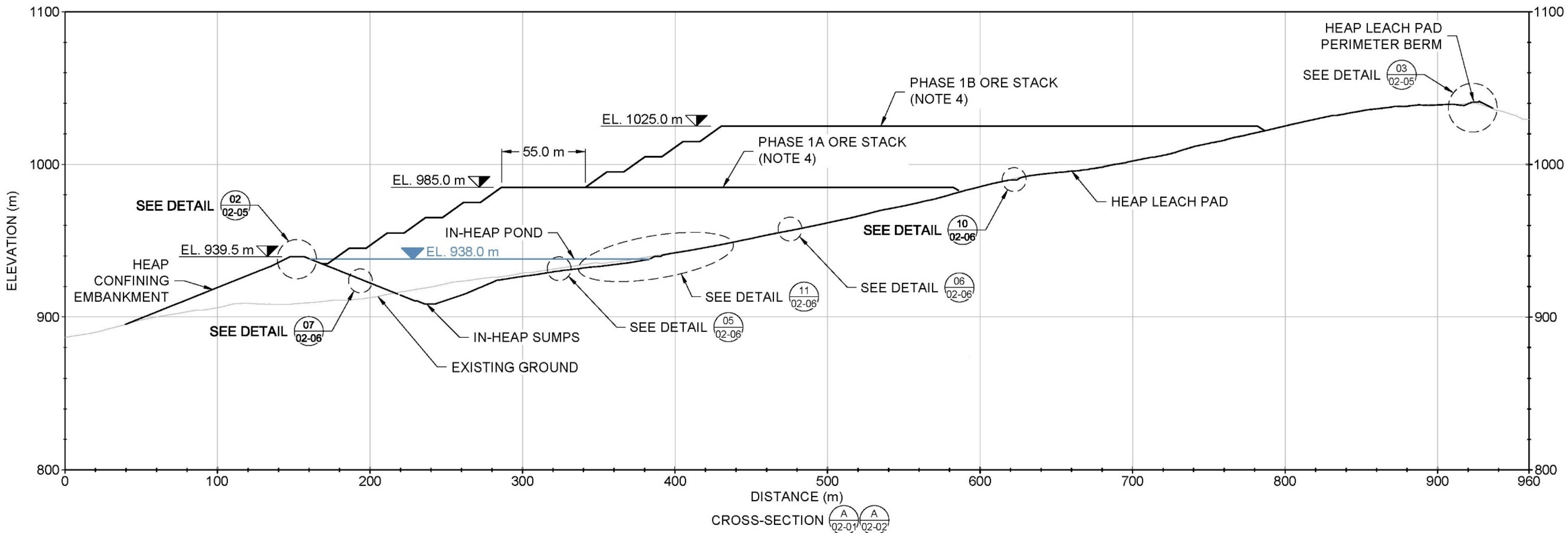
Date: 2019/02/25

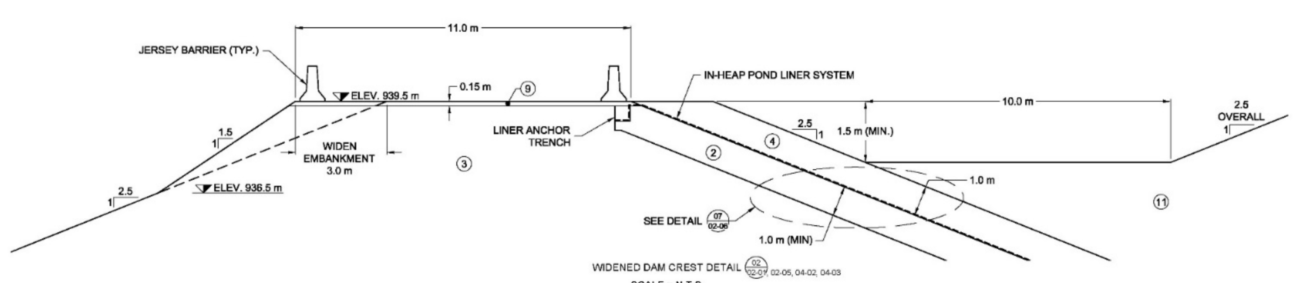
Figure: 4.2-1

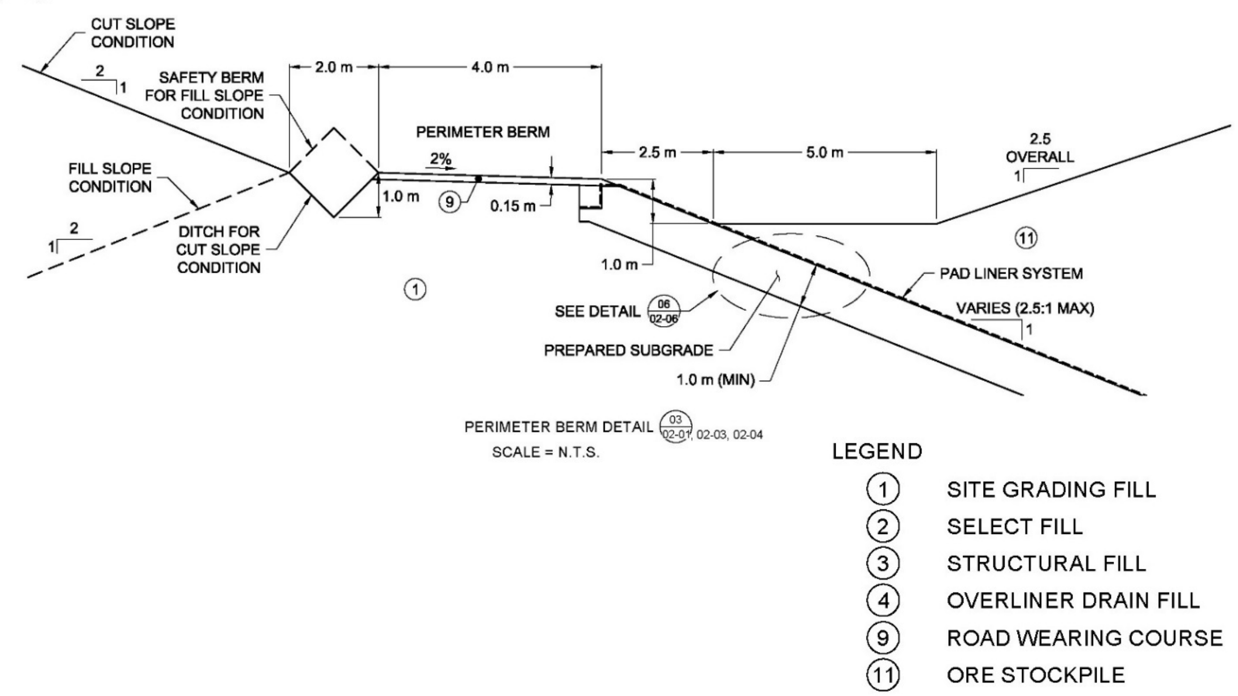
0 125 250 500 Metres

EAGLE GOLD PROJECT
YUKON TERRITORY

Site General Arrangement



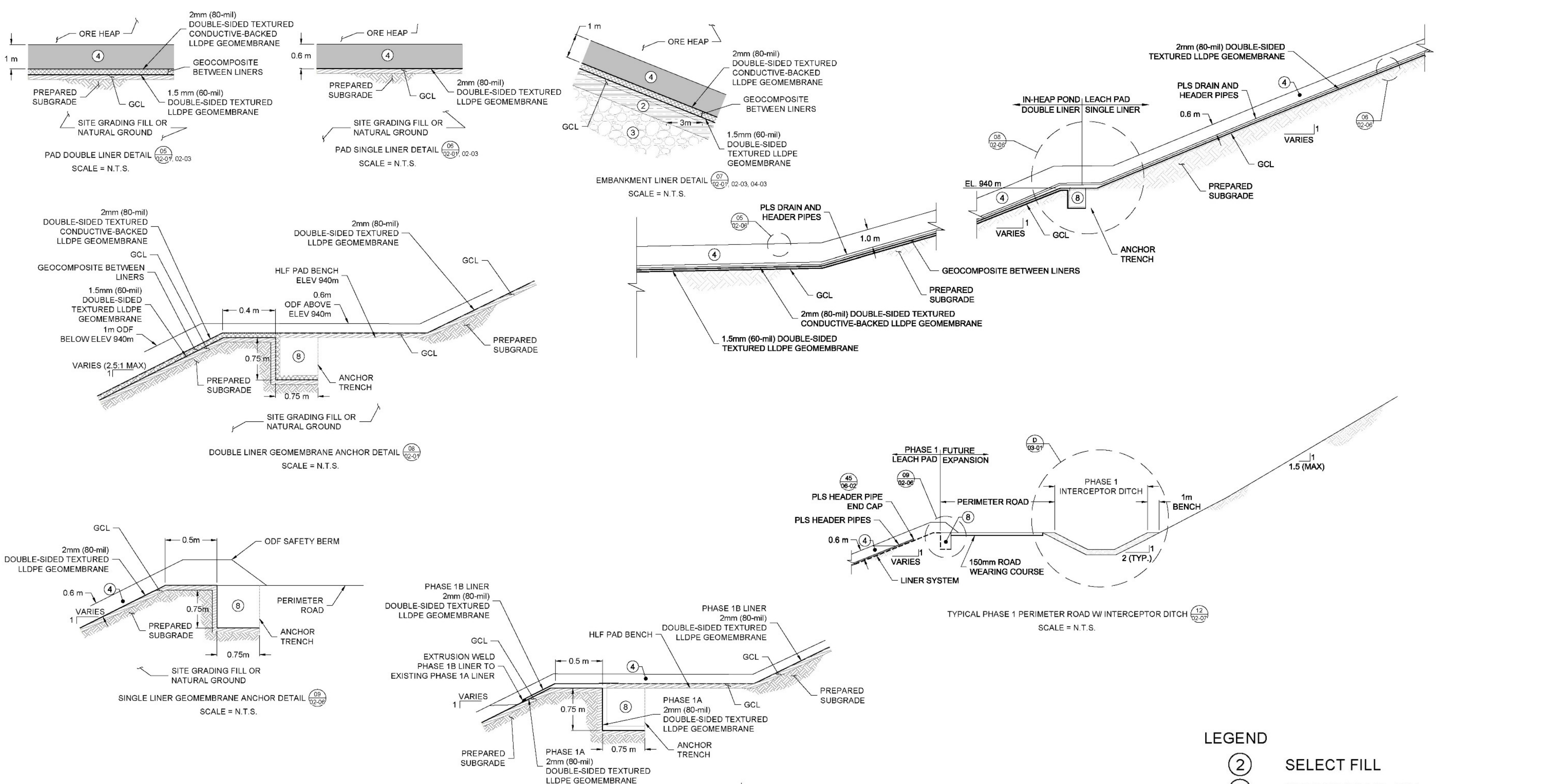




Notes:

1. Source: BGC (2017). Drawing Nos. EGHLF-XD-02-03 and EGHLF-XD-02-05 in Eagle Gold Project Heap Leach Facility Detailed Design Report. Prepared for StrataGold Corporation November 16, 2017.
2. Phase 2 and 3 pad and ore pile are not shown; required conveyor ramps on ore pile not shown.
3. This Drawing may have been reduced or enlarged. All fractional scale notations indicated are based on original format drawings.
4. Ore stacking plan (by others) may result in ore heap pile limits different from shown here. Phases 1A/1B ore stacks are representative of the first eight quarters of developed by Forte Dynamics Inc.

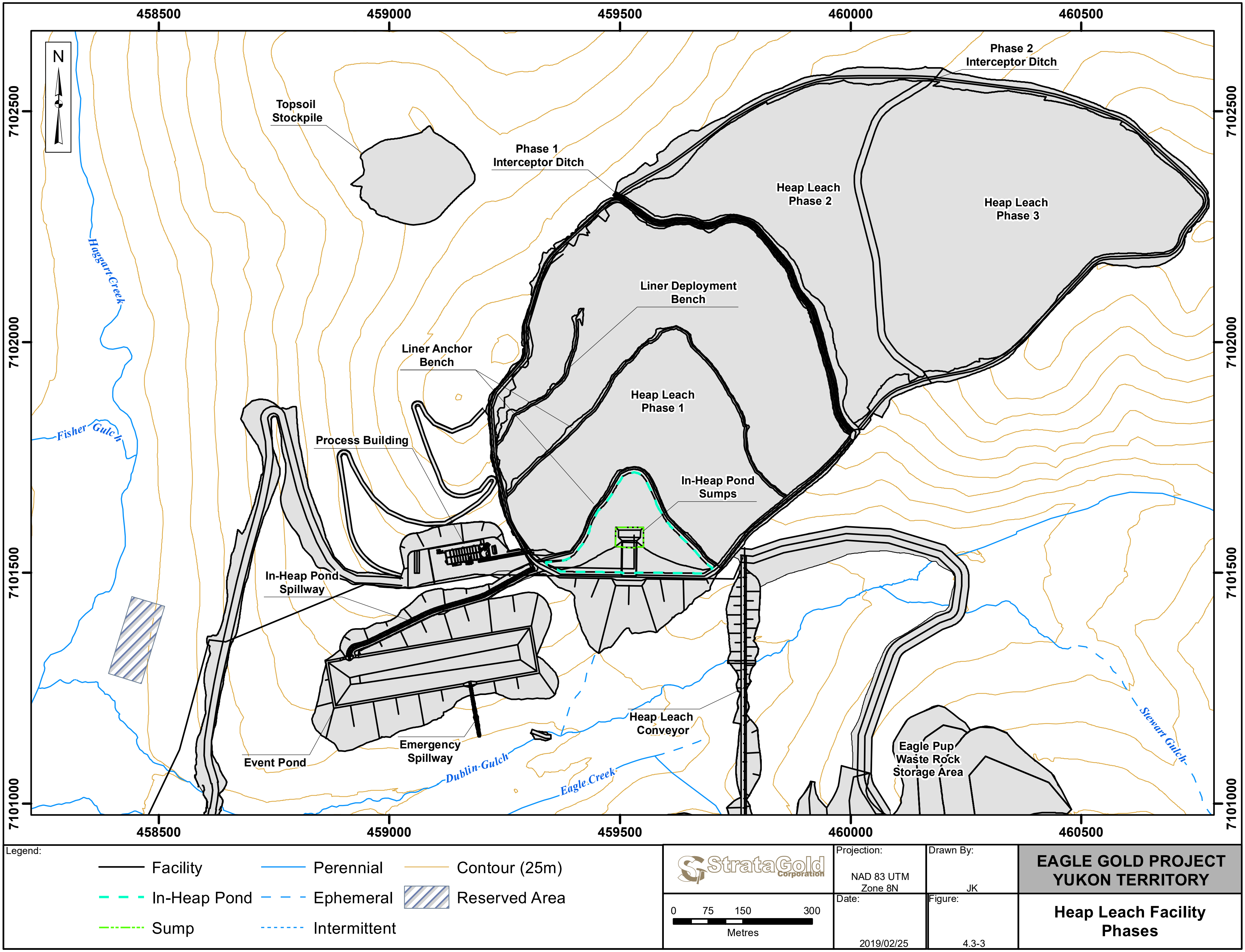
Figure 4.3-1: Heap Leach Facility Cross Section and Corridor Typical Sections



Notes:

1. Source: BGC (2017). Drawing No. EGHLF-XD-02-06 in Eagle Gold Project Heap Leach Facility Detailed Design Report. Prepared for StrataGold Corporation November 16, 2017.
2. This Drawing may have been reduced or enlarged. All fractional scale notations indicated are based on original format drawings.

Figure 4.3-2: Liner Details



458500
459000
459500
460000
460500
7102500
7102000
7101500
7101000
N
Topsoil Stockpile
Phase 1 Interceptor Ditch
Phase 2 Interceptor Ditch
Heap Leach Phase 2
Heap Leach Phase 3
Liner Deployment Bench
Liner Anchor Bench
Heap Leach Phase 1
Process Building
In-Heap Pond Sumps
In-Heap Pond Spillway
Heap Leach Conveyor
Emergency Spillway
Event Pond
Eagle Pup Waste Rock Storage Area
Haggart Creek
Fisher Gulch
Dublin Gulch
Eagle Creek
Stewart Gulch
Legend:
Facility
In-Heap Pond
Sump
Perennial
Ephemeral
Intermittent
Contour (25m)
Reserved Area
StrataGold Corporation
Projection:
NAD 83 UTM Zone 8N
Drawn By:
JK
0 75 150 300
Metres
Date:
2019/02/25
Figure:
4.3-3
EAGLE GOLD PROJECT
YUKON TERRITORY
Heap Leach Facility Phases

5 REGULATORY REQUIREMENTS

Regulations and permitting requirements for heap leach facilities in the Yukon Territory are not expressly stated; but rather, they have historically relied on regulations from other regions and on precedence established from other successful projects. Permitting considerations for the HLF either remain consistent with those proposed during the regulatory approvals process or, in some cases, have been revised to meet the conditions imposed by the Type A WUL QZ14-041 and to address stakeholder input received during the regulatory approvals process.

The Heap Leach Facility design standards adopted for the project include:

- The regulatory requirements of Yukon and Canada;
- The YWB Licensing Guidelines (2009);
- The requirements specified in the WUL issued for the Project;
- Guidelines from the Canadian Dam Association (2013,2014); and
- Permitting requirements of the State of Nevada. These are not regulatory requirements in the Yukon, but are considered as standards for best practice.

6 BASIS OF HLF DESIGN AND DESIGN CRITERIA

6.1 DESIGN REQUIREMENTS

There are currently no published international standards for the design and construction of the HLF. Guidelines from the State of Nevada State, where there is a preponderance of heap leach facilities, provide minimum standards for heap leach facilities and have been adopted for the Project. North American standards for the design of embankment dams were used where applicable, specifically the Canadian Dam Association (CDA 2014) guidelines. Table 6.1-1 summarizes the main technical and permitting requirements for the State of Nevada for the key elements of the HLF design.

Table 6.1-1: Summary of HLF Design and Permitting Requirements

Heap Leach Feature	Description
Leach Pad	System must have containment capability equal to or greater than that of a composite liner consisting of a synthetic liner over one foot of compacted soil at a permeability of 1 x 10^{-6} cm/s or 1 x 10^{-5} cm/s if a leak detection system is used beneath portions of the liner with the greatest potential for leakage Synthetic liners must be rated as having resistance to fluid passage equal to a permeability of less than or equal to 1 x 10^{-11} cm/s.
Solution Ponds	System must have a primary synthetic liner and a secondary liner that meet the above-described liner specifications. The synthetic liners must be separated by a fluid transmission layer which is capable of transmitting leaked fluids at a rate that will ensure that excessive head will not develop on the secondary liner.
Solution Management and Containment	Process components must be demonstrated to have the capacity to “withstand” the runoff from a 100-year, 24-hour precipitation event. In addition, facility fluid management systems must demonstrate the capability of remaining “fully functional and fully contain all process fluids including all accumulation resulting from a 25-year, 24-hour precipitation event. The foregoing standards are minimal and additional containment capacity may be required if surface water bodies or human populations are in close proximity to the facility, or if groundwater is shallow.
Foundations	Consider static / dynamic loads and differential movement or shifting.
Construction QA/QC	Regulations require that each applicant develop and carry out a quality assurance and quality control program for liner construction. A summary of the QA/QC program must be submitted with as-built drawings after construction has been completed.
Neutralization of Spent Ore	Spent ore, whether it is to be left on pads or removed from a pad, must be rinsed until it can be demonstrated either the remaining solid material, when representatively sampled does not contain levels of contaminants that are likely to become mobile and degrade the waters of the state under the conditions that will exist at the site, or, the spent ore is stabilized in such a manner as to inhibit meteoric waters from migrating through the material and transporting contaminants that have the potential to degrade the waters of the state.

6.2 DESIGN BASIS

The YWB Licensing Guidelines for Type A Quartz Mining Undertakings provide specific guidance for selected mine site earthworks facilities, as follows:

"General: Type A quartz mining undertakings may vary significantly in their magnitude and in the potential environmental effects associated with them. The guidelines contained in this document assume the development of a mine with significant potential environmental impacts such as those resulting from acid rock drainage or the failure of a large tailings impoundment. Projects such as this are considered to fall into the Very High Consequence of Failure category described in the Canadian Dam Safety Guidelines (January 1999). In situations where this category is not appropriate for some reason, the Board is prepared to consider well developed and documented justification for the use of alternative consequences of failure criteria developed in accordance with the Canadian Dam Safety Guidelines."

Further, specific design guidance is included as follows:

- The design, construction, operation, maintenance and surveillance of dams and associated water management structures should be carried out in a manner which is consistent with the recommendations contained in the Canadian Dam Safety Guidelines (January 1999) for the Very High Consequence Category, unless compelling reasons consistent with the Canadian Dam Safety Guidelines for a lower consequence category are provided.
- Long-term dams and associated water management structures should be designed to withstand the Maximum Credible Earthquake (MCE) and pass the Probable Maximum Flood (PMF). Shorter term structures may be built to lesser standards but a compelling rationale for the selected criteria must be provided.
- Heaps should be designed to have a minimum factor of safety under static loading of 1.3 for short term cases (i.e. within the mine life) and 1.5 for long term cases (i.e. abandonment) as described in the Investigation and Design of Mine Dumps (British Columbia Mine Dump Committee, 1991). The factor of safety for dams should be as recommended in the Canadian Dam Safety Guidelines (January 1999).
- Designs for dams and associated water management structures, rock dumps, and heaps should recognize the probable presence of permafrost and should include appropriate measures to manage permafrost and maximize the stability of the structures consistent with recommendations contained in the Canadian Dam Safety Guidelines (January 1999).

Although the 1999 and 2007 CDA are referenced by the regulatory guidance documents summarized above, the latest version of the CDA guidelines (2013), including the Application of Dam Safety Guidelines to Mining Dams Technical Bulletin, were used for the Project.

BGC (2017b) performed a dam breach analysis to provide input into evaluating the HLF embankment hazard classification, per Canadian Dam Association (2013) guidelines. The results confirm that the confining embankment can be classified as a Significant dam (i.e., there is no permanent population or infrastructure at risk in the inundation path, and restoration of fish and wildlife habitat is highly possible). Nevertheless, the WUL for the Project imposes an Extreme dam classification (the most stringent possible) for hydrologic and storage criteria. Thus, the Extreme hydrologic and storage criteria have been used for the HLF design. The WUL does not include a requirement to impose more conservative geotechnical criteria beyond those specified in the CDA guidelines; nevertheless, geotechnical criteria applied here assume a High hazard dam classification. The dam classifications used here also consider the input from the Application of Dam Safety Guidelines to Mining Dams (CDA 2014), and have been vetted during consideration and consultation between owner and regulators.

6.3 ENGINEERING DESIGN CRITERIA

The parameters and criteria presented in Table 6.3-1 below form the basis of design for the HLF. Geotechnical design criteria were developed by BGC while ore parameters were provided by StrataGold or other consultants working on the Project.

Table 6.3-1: Summary of HLF Design and Permitting Requirements

General	Quantity/Criteria
Heap ore capacity	Approximately 86 Mt
Ore processing	Average of 10.8 Mt/a of crushed ore over a 275-day crushing and stacking season Three-stage crushing to 6.5 mm (P_{80}) - primary crushing 365 days (29,500 tpd), secondary/tertiary 275 days per year (39,154 tpd)
Leach pad type	Permanent, multiple lift
Stacking Rate	Approximately 40,000-45,000 tpd
Stacking method	Conveyor-stacker
Stacked dry density of ore	Initial - 1.7 t/m^3
Stack / lift height	Nominal 10 m lifts
Overall slope angle of stacked ore	2.5:1 (H:V), 22 degrees
Ore Setback	5 m from perimeter road 10 m from dam
Leach schedule	365 days per year
Solution application method	Drip emitters (buried during cold weather)
Solution application rate	10 L/hr/m^2 (7 L/hr/m^2 nominal operations application rate)
Total leach cycle time	90-day primary leach (45-day primary leach planned for operations)
Solution application flow	2,070 m^3/hour (1,500 m^3/hour nominal operations rate)
Geotechnical Stability	**Quantity/Criteria**
Design Basis Earthquake (DBE)	0.14g (1 in 475-year return period) 0.25g (1 in 2475-year return period)
Maximum Design Earthquake (MDE)	0.35g (Acceleration at the site estimated for the Maximum Credible Earthquake) Moment Magnitude 6.0
Minimum embankment Factor of Safety	Static Loading - 1.5 (impounding), 1.3 (non-impounding), Seismic Loading - 1.0 (use pseudo-static methods)
Permafrost	Ice-rich materials encountered in the embankment foundation will be removed; ice-rich material in the pad or pond foundations, if thaw unstable, will be removed.

Confining Embankment	Quantity/Criteria
General	To provide stable confinement of the ore and create a In-Heap Pond
Overflow spillway	Sized to pass the PMF peak flow with 0.5 m of freeboard assuming heap storage is at capacity at the start of the event.
Groundwater	**Quantity/Criteria**
General	A drainage system is required beneath the liner system to control groundwater pressures. The system is to collect and monitor groundwater in a controlled manner before discharge downslope of the containment embankment if discharge criteria from QZ14-041 are met.
Pad Liner System	**Quantity/Criteria**
Overliner Drain Fill (ODF)	Crushed clean rock to provide a free draining layer under the placed ore and to protect the lining system from damage by ore placement while not impacting the conveyance of solution to the recovery wells. ODF will consist of a minimum 1.0 meter thickness (within the In-Heap Pond, minimum of 0.6 m otherwise) of minus 38 mm clean durable rock with less than 20 percent passing the No. 4 ASTM sieve size, and less than 5 percent fines passing the No. 200 ASTM sieve size and minimum in place hydraulic conductivity of $2x10^{-4}$ m/s.
Geosynthetic (geomembrane) Liner	Suitable liner material to provide required puncture resistance, elastic strain range and resistance to solution attack and chemical breakdown along with cold weather performance for the Project's climate conditions (refer to LLDPE project standard specifications).
Geosynthetic Clay Liner (GCL)	Geosynthetic clay liner below the geosynthetic liner to provide a composite liner to minimize leakage. Objective maximum permeability 1×10^{-5} cm/s or 1×10^{-6} cm/s in the absence of a leachate detection and removal system.
Leachate collection and recovery system	A system to collect leachate and convey it to solution recovery wells. System to comprise ODF and a network of collection pipes to convey solution to the In-Heap Pond area while limiting solution head on liner.
Leak detection and recovery system (LDRS)	A system within the In-Heap Pond and Events Pond to collect leakage through the composite liner and convey it to monitoring points. The system to comprise geonet or similar synthetic drainage product to collect and convey any leaked solution to a gravel filled sump and pumping system.
LDRS monitoring	Monitoring of the flow into the LDRS to ensure that allowable rates (determined by permitting authorities) are not exceeded.
Solution Recovery Wells	**Quantity/Criteria**
General	Solution is to be recovered from the heap through inclined well casings equipped with submersible pumps installed in the In-Heap Pond solution storage area along the upstream dam slope. Adequate access for installing and recovering pumps from well casings will be provided on the dam crest.
Events Pond	**Quantity/Criteria**
General	The purpose of the Events Pond (constructed downstream of the embankment) is to temporarily store excess inflows that cannot be stored in the In-Heap Pond. Any overflow into the events pond will be evacuated, and used as make-up water,

	as fresh ore is added to the HLF. During the initial heap operation, the Events Pond may also be used as temporary storage for make-up water. Otherwise, the Events Pond will be kept dry.
Overflow spillways	Sized for routed PMF peak flow with 0.5 m of freeboard.
Storage Capacity	Sized to contain the runoff volume from the PMF event assuming the In-Heap Pond is full.
Liner system	Lining to comprise a double composite geosynthetic liner system with LDRS

7 HEAP LEACH FACILITY OPERATIONS

. The HLF will be progressively developed in three phases: one phase during construction, and two phases during operations (Figures 7.1-1 to 7.1-3). Ore will be mined and delivered to the primary crusher at a rate of 29,500 t/d (10.76 Mt/a). The secondary and tertiary crushing system, conveyors and portable stacking system are designed to crush and place ore at a rate of 39,200 t/d. The operation of the heap leach pad involves loading the pad at a rate of approximately 29,500 tonnes/day during Year 1 then 39,154 tonnes/day thereafter (for 275 loading days/year) with 10 m lifts, and distributing leach solution at a nominal rate of 1,500 m^3/hr or a unit rate of 7 L/hr/m^2.

7.1 PAD LOADING

The HLF conveyor system will be operated during a 275 day per year period (i.e., approximately March to November) using a conveyor stacking system. The 90 day primary crushed ore stockpile will be fed to the secondary and tertiary crushing- system once stacking operations resume during the 275 day period. The planned heap stacking system will include:

- A series of overland conveyors;
- Grasshopper-type portable transfer conveyors;
- A mobile bridge conveyor; and,
- A radial stacking conveyor.

The HLF feed conveyors will be installed adjacent to the heap leach pad, and then extended as needed around the western circumference pad, from the crusher area. The grasshopper conveyors will transport the ore from the overland conveyors to the bridge conveyor.

Lime will be added to the ore following tertiary crushing during conveyance to the HLF at an estimated average rate of 1.00-2.00 kg/tonne until further operational data is obtained and adjustments can be made.

The ore will be placed in 10 m lifts using the radial stacker. The leach lifts will be constructed from east to west, retreating up the slope of the pad. As the stacker retreats, the grasshopper conveyors will be removed from the transfer train and relocated in an adjacent area so that the heap will be constructed from the toe upwards in a series of lifts.

Bench widths of 10 m have generally been included between each successive 10 m lift of ore placed on the heap, such that an overall 2.5H:1V maximum heap slope results. Ore will be placed such that:

- Ore is not placed outside limits of the mine plan or approved limits of liner and overliner;
- Ore loading will always occur in an up-slope direction where possible;
- Overall heap slopes are equal to or flatter than the design slopes shown in the Design Report. The maximum slope must not exceed the general design slope of the middle section of the heap of 2.5:1; however, the slope is variable as described in the Design Report;
- Ore placement on the overliner is not damaging the ODF or underlying solution collection pipework or liner system;
- Ore being placed generally meets the gradation limits for the ore used as a basis for design; and

- New ore is not placed on snow with accumulations of greater than 10 cm in thickness; excess snow will be pushed to designated snow collection areas to allow continuation of ore placement.

The In-Heap Pond area will be the first area filled with ore. The stacking plan developed for the Project considers using various ore particles sizes within the In-Heap Pond area to create a high permeability zone for solution collection. This gradation of material includes drainage gravel, 16 mm crushed ore, a 1 m “filter layer” of 12 mm ore placed over the 16 mm ore to provide a transition zone between it and the 6.5 mm P80 ore.

As stacking operations advance, ore will be stacked on top of the heap leach pad in 10 m lifts. Ramps will be established to allow conveyor access to the top of the heap for construction of additional lifts. For areas of the heap that will be under leach in the winter months, the ore will be placed initially in 10 m lifts. To insulate the drip emitter system, the leach lines will be “ripped in” to the ore and covered to prevent freezing. To insulate larger piping, an additional insulation cover and crushed ore may be placed in stockpiles on the heap and spread by low ground pressure dozers to facilitate rapid placement and spreading of the ore.

7.2 ORE STACKING PLAN

The heap leach stacking plan was designed in coordination with the mining plan to efficiently schedule ore stacking and leaching over the LOM. The stacking plan is based on a loading rate of approximately 29,500 tonnes/day during Year 1 then 39,154 tonnes/day thereafter for 275 loading days per year.

Figures, 7.2-1, 7.2-2 and 7.2-3 illustrate the leach pad development plan through the LOM.

7.3 SOLUTION DELIVERY AND LEACHING

Barren cyanide solution will be applied to the ore stacked on the HLF to extract the gold. After passing through the stacked ore, the gold-bearing PLS drains to the In-Heap Pond where it will be recovered by the PLS pumps and pumped to the ADR facility for processing.

7.3.1 Barren Solution Delivery

A series of barren solution pumps located at the ADR facility will pump solution to the heap leach pad. Pressure piping will be dual contained at all times. Fresh sodium cyanide solution will be added at a rate of approximately 0.42 kg/tonne NaCN and adjusted as required (see Cyanide Management Plan) and anti-scalants will be added as needed following the barren solution tank at the ADR plant, prior to the barren solution pumps. The primary supply line will track along the west side of the HLF and has been located a safe distance from the service roads and conveyors. All pipe crossings will be maintained to prevent crushing of the double lined pipes or damage to the liner.

7.3.2 Leaching

A series of pipe headers will distribute the solution to secondary and tertiary headers, and ultimately to drip emitters within the ore stack. During the summer months, barren solution will be applied to the heap with drip emitters laid on top of the ore. During the cold winter months, the solution will be applied with drip emitters buried to a depth of approximately 1 m. Leaching operations will be conducted such that:

- All pipe crossings are installed and operated to prevent crushing of the pipes;
- Solution distribution lines are working properly;

- There is no or minimal ponding of leach solution on the heap surface;
- Alkalinity of the leachate solution will be maintained at a target of 10.5 pH, with an allowable range of 10.0 to 11.2; and
- Any leaks in the pipes will be repaired.

7.3.3 In-Heap Pond

The In-Heap Pond, created by the embankment, is designed to be a saturated zone within the lower extent of the HLF ore pile, with capacity to up to 126,800 m^3 of solution. The available storage capacity is located in the interstitial pore spaces between the individual particles of the ore in the heap contained behind the embankment and as a result of the targeted and residual moisture content of the ore. Typically, the In-heap Pond occupied operational volume will be about 52,200 m^3 (considered sufficient to keep the sump full and prevent pump cavitation plus the gradation of moisture content above the operational level that would be expected under normal conditions). The water level in the In-Heap Pond will be maintained as low as practical to maximize available capacity for storm events and to ensure that solution is constantly available for the ADR process and the subsequent production of gold. Up to four vertical turbine pumps designed for a capacity of 2,070 m^3/h will be used to advance the PLS to the ADR plant at 1,500 m^3/h.

If the solution storage capacity of the In-Heap Pond is exceeded due to an extreme climatic event, the overflow is directed to the Events Pond. The Events Pond had an initial design criteria is the containment of a full Probable Maximum Flood event (248,800 m^3 which was subsequently increased to 276,600 m^3) assuming that the In-Heap Pond is already full; however, the actual designed capacity of the Events Pond is 299,900 m^3 to the spillway invert at elevation 894.5m with a total capacity of 340,400 m^3 to the crest elevation of 895.5m. The combined storage volumes of the In-Heap Pond and Events Pond (to the spillway inverts) total 426,700 m^3.

In the event of an emergency, or other unforeseen circumstance, in which pumping of solution ceases, or in the event of excessive surface runoff from the heap leach pad, discharge of excess water or solution will be directed in a controlled manner through a lined spillway to the Events Pond. Solution levels within the In-Heap Pond are expected to be kept low during normal operations. However, during emergency situations, the HLF spillway will prevent overtopping of the embankment, and will maintain containment of solution. The HLF spillway is designed to safely convey the flow from the Probable Maximum Flood (PMF) event to the Events Pond.

The HLF Contingency Water Management Plan (HLF CWMP) describes water management methods such as the use of in-heap dynamic storage, the use of excess solution evaporation and sublimation, snowpack management, solution treatment and release to safely control water levels in the HLF. The HLF CWMP includes specific triggers for implementing management strategies to address excess water in the HLF that could result in a potential release to the environment. The specific triggers, which are based on maintaining solution storage capacity of concurrent extreme events whilst retaining freeboard volume within the Events Pond, are phase dependent as shown in Table 7.3-1.

Table 7.3-1: Definitive Events Pond Volume Triggers

Phase	72-hour Draindown Volume (m^3)	0.5 m Freeboard Volume (m^3)	24-hour 100-year Event Volume (m^3)	Desired Available Storage Volume Required (m^3)	Percentage Full of Events Pond
1	105,200	19,600	29,700	154,400	49%
2	105,200	19,600	42,000	166,800	44%
3	105,200	19,600	58,700	183,500	39%
4	105,200	19,600	58,700	183,500	39%
5	105,200	19,600	58,700	183,500	39%

The percentage full levels for the Events Pond will be clearly marked on the Events Pond Liner so that basic visual inspection will inform all personnel that contingency actions, as considered in the HLF CWMP, need to be taken.

The measure considered in the HLF CWMP provide flexibility and management of solution options for operators.

7.4 HEAP LEACHING CYCLE

Table 7.4-1 illustrates the heap leaching cycle from initiation through the LOM.

Table 7.4-1: Heap Leaching Plan

Lift No.	Elevation (m)	Mine Year	Primary Leach (days from start of stacking)	Days Leached	Secondary Leach (days from start of stacking)
High Perm Area	930	1	212.00	19	231
Intermediate Liner	935	1	212.00	19	231
Lift 1	945	1	273.00	19	292
Lift 2	955	1	304.00	9	313
Lift 3	965	1	344.00	19	363
Lift 4	975	1	396.00	39	435
Lift 5	985	1	548.00	19	567
Lift 6	995	1	597.00	30	627
Lift 7	1005	1	658.00	40	698
Lift 8	1015	2	731.00	42	773
Lift 9	1025	2	811.00	45	856
Lift 10	1035	2	993.00	45	1038
Lift 11	1045	3	1105.00	45	1150
Lift 12	1055	3	1317.00	45	1362
Lift 13	1065	3	1461.00	45	1506
Lift 14	1075	4	1673.00	45	1718

Lift No.	Elevation (m)	Mine Year	Primary Leach (days from start of stacking)	Days Leached	Secondary Leach (days from start of stacking)
Lift 15	1085	4	1805.00	45	1850
Lift 16	1095	5	2009.00	45	2054
Lift 17	1105	5	2131.00	45	2176
Lift 18	1115	6	2242.00	45	2287
Lift 19	1125	6	2435.00	45	2480
Lift 20	1135	7	2536.00	40	2576
Lift 21	1145	7	2637.00	45	2682
Lift 22	1155	7	2800.00	30	2830
Lift 23	1165	7	2892.00	19	2911
Lift 24	1175	8	2962.00	30	2992
Lift 25	1185	8	3104.00	30	3134
Lift 26	1195	8	3165.00	19	3184
Lift 27	1205	8	3214.00	12	3226
Lift 28	1215	9	3266.00	30	3296
Lift 29	1225	9	3306.00	30	3296

Based on the current leaching plan, the majority of the lifts will be leached for the design leaching cycle (45 d). The first several lifts will experience a reduced leach cycle time, as additional lifts are progressively stacked on top before the full leaching cycle is complete. These lifts will have reduced leaching cycle times and consequently have some impairment in gold recovery. The shortened leaching cycle for these lifts will result in some leachable gold remaining in the ore and will simply take longer to leach out of the heap. The remaining gold will continue to complex and will be recovered when the heap leach pad is rinsed.

7.5 COLD WEATHER CONSIDERATIONS

The following parameters have been incorporated into the HLF design to provide for year round heap leaching activities:

- selected an in-valley heap configuration to create a heat sink
- selected a south facing valley
- use of an In-Heap Pond for PLS storage
- sizing of the fine ore crushing operation to allow increased production rate during warm months
- ore stacking on the heap leach pad during the warm season (275 d)
- storing ore on the ore storage pad during the winter season
- sizing of the starter heap leach pad to accommodate more than one year of ore production to allow advanced stacking for at least the first winter season

The process pumping and solution delivery system includes pumps, pipelines, valves, and associated controls to move solution between the ADR plant and the HLF. The system includes the following provisions for year-round operation:

- buried emitters (ripped in by dozer) and covered to a minimum 0.6 m depth
- heat traced and insulated barren solution tank
- heat traced and insulated (or buried) pipelines as needed
- heating of barren solution is not anticipated for winter operations, but will be further evaluated as operation commences, with measures in place to heat solution if needed.
- in-heap temperature monitoring
- generators for backup power supply to pumps and emergency process equipment as described in the HLF Contingency Water Management Plan and HLF Emergency Response Plan.

As an additional cold weather consideration, prior to freshet, and at various time throughout the winter, the snow water equivalent (SWE) on the HLF will be measured to establish the volume of water that may enter the HLF during freshet. This volume of water may be actively managed if the solution levels within the HLF indicate that the definitive Events Pond triggers would be reached. This management strategy is discussed further in the HLF CWMP and will benefit both the water balance for the facility and enhancing leaching efficiency. The heap leach facility will be constructed in lifts, with benches every ~10m in lift height. During excess snow accumulation years, and prior to melting or freshet conditions, snowpack accumulated on the flat surfaces will be pushed via dozer off to the sides and ends of the facility which will delay the melt due to thermal process in larger snowpacks, and where applicable, pushed off the facility into managed diversion structures.

7.6 LEACHATE SOLUTION COLLECTION SYSTEM

The heap leach pad consists of two liner systems (see Figure 4.3-2), the up-gradient liner system and the lower, in-heap pond liner system. The lower section of the heap leach pad acts as an In-Heap Pond for the primary storage of PLS. Located above this liner system is a layer of drainage rock (with a P80 of 16 mm) which has been designed to transmit the PLS to a collection system. This overliner drainage fill serves to efficiently transmit the PLS and protect the primary liner from damage by rocks and/or equipment which might come in contact with the liner.

The HLF drain pipes will consist of 100-mm, 250-mm and 450-mm diameter corrugated dual-wall, perforated ADS N-12 PE pipes. A series of 100-mm primary collector pipes are spaced about 25 m (average) on center and arranged in a “herringbone” pattern to convey flows for collection in 450-mm header pipes. Where slope lengths dictate, secondary 250-mm collector pipes will be installed to convey flows from the 100-mm pipes to the 450-mm header pipes.

Within the In-Heap Pond there are five vertical turbine pumps, with three or four operating and one or two spare. The redundancy in installed pumps is dictated by the footprint of the HLF. The inclined arrangement will consist of five thick-walled, steel pipes, to allow for raising and lowering of a submersible pump. Each well has an outer casing connected to the 450 mm collection lines, mechanical pump, and related electrical and control components. These wells and pumps serve to convey the pregnant solution to the process plant.

The Leachate Collection System pumping rates will be optimized for ADR plant feed and to maintain appropriate solution depths in the HLF to prevent pump cavitation and to maintain storage volumes in the In-Heap Pond for upset conditions as necessary. Piezometers monitor these levels and are used confirm the low phreatic conditions during operations as described in section 9.2 Instrumentation and Monitoring below.

To maximize the efficiency of the ore's drainage and to minimize the potential for leakage through the pads' liner system, the hydraulic head above the liner was designed to be less than a maximum height of 0.6 m resulting in a minimum secondary pipe spacing ranging from 12 m to 17 m depending on the slope of the leach pad. The effects of the maximum load on the pipes were analyzed to verify acceptable deflections are not exceeded to ensure integrity of the pipes under operational conditions. Figure 7.6-1 provides an overview of the system.

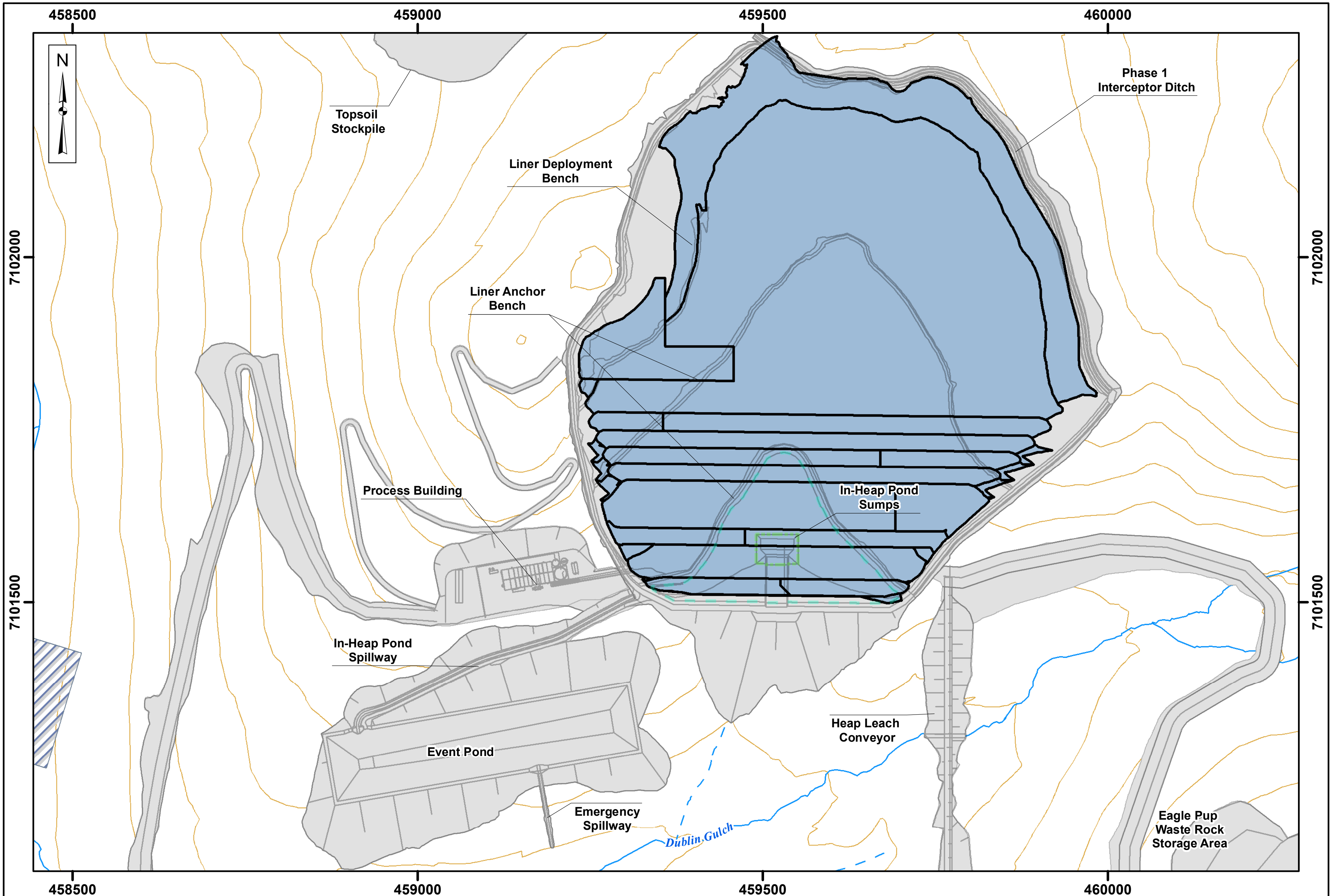
7.7 LEAK DETECTION AND RECOVERY SYSTEM

A leak detection and recovery system (LDRS) will be installed between the upper and lower geomembrane liners of the Events Pond and the In-Heap Pond. Any fluids that report to the LDRS will drain to a monitoring sump equipped with an automatic, fluid level activated pump. The pump is sized to sufficiently remove fluids to minimize head on the secondary liner (Figure 7.7-1).

This LDRS allows for the detection, containment and pump back of any leakage resulting from a possible liner failure before any contamination can reach the groundwater. The sump monitoring instruments provide early alerts to the presence of flow. Collected solution will then be pumped back to the HLF. Additional information on the monitoring of solution levels in the monitoring sump, as well as response to the presence of solutions, is included in section 9.2.3 LDRS Levels below.

7.8 EVENTS POND

A lined Events Pond located downstream of the HLF (Figure 4.3-3) will be constructed to temporarily store excess process solution that may occur during upset conditions, freshet, and direct precipitation. The solution contained in this pond will be recycled back into the heap leach circuit as required when normal operation resumes or as dictated by the HLF CWMP (i.e., if the definitive Events Pond trigger indicate that the excess solution should either be placed in dynamic storage or treated and released). The pond has been sized to accommodate the PMF storm event from the ultimate HLF (all phases). The pond will be constructed to include leak detection and recovery within the liner system (see section 7.7).



Legend:

Facility	Phase 1 (Lift 1-11)	Perennial
In-Heap Pond		Ephemeral
Sump		Intermittent
Contour (25m)	Reserved Area	

StrataGold Corporation

Projection: NAD 83 UTM Zone 8N

Drawn By: JK

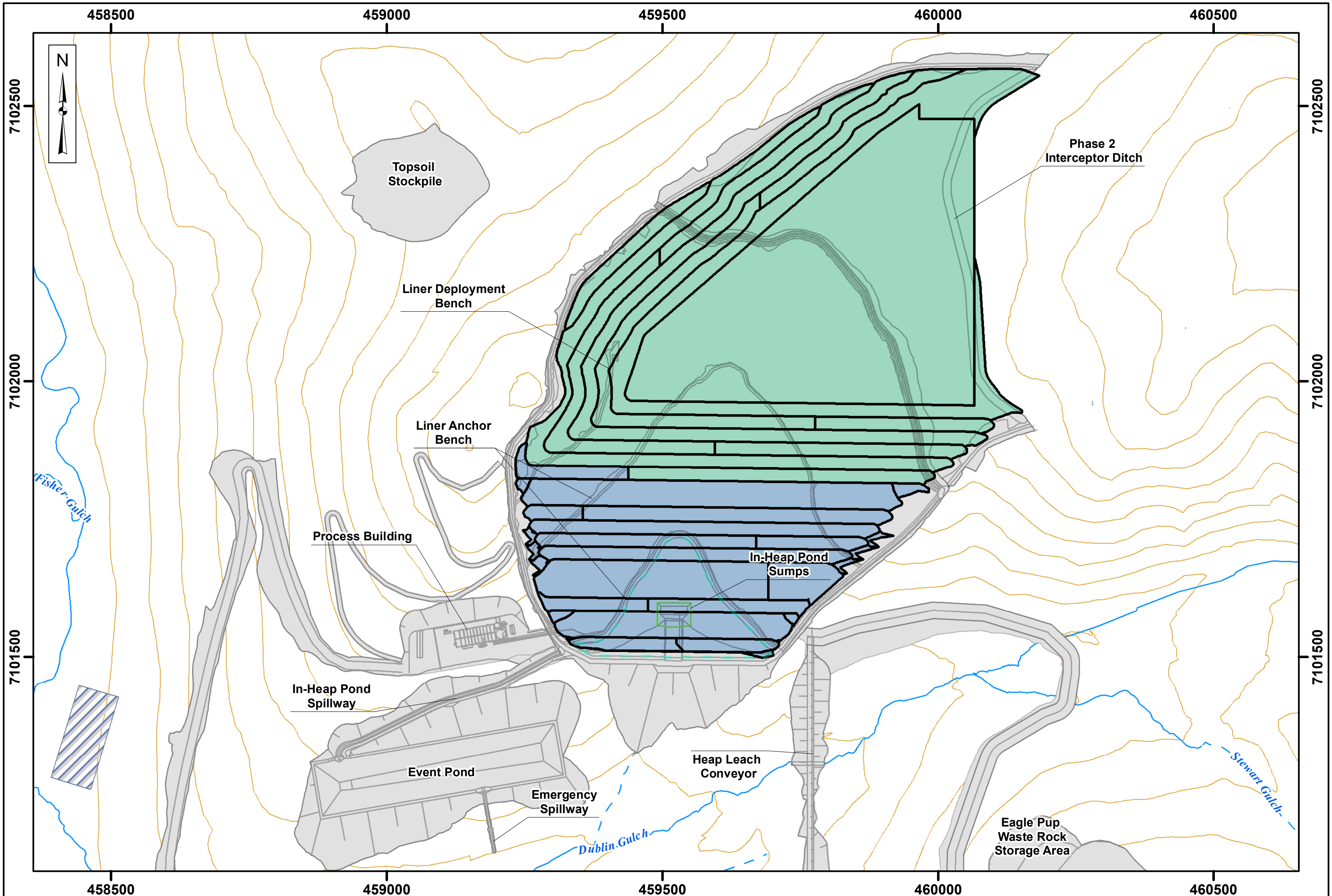
0 50 100 200 Metres

Date: 2019/02/25

Figure: 7.2-1

EAGLE GOLD PROJECT
YUKON TERRITORY

Heap Leach Facility Phase 1



Legend:

Facility	Phase 1 (Lift 1-11)	Perennial	Contour (25m)
In-Heap Pond	Phase 2 (Lift 12-17)	Ephemeral	Reserved Area
Sump		Intermittent	

StrataGold Corporation

0 50 100 200 Metres

Projection: NAD 83 UTM Zone 8N

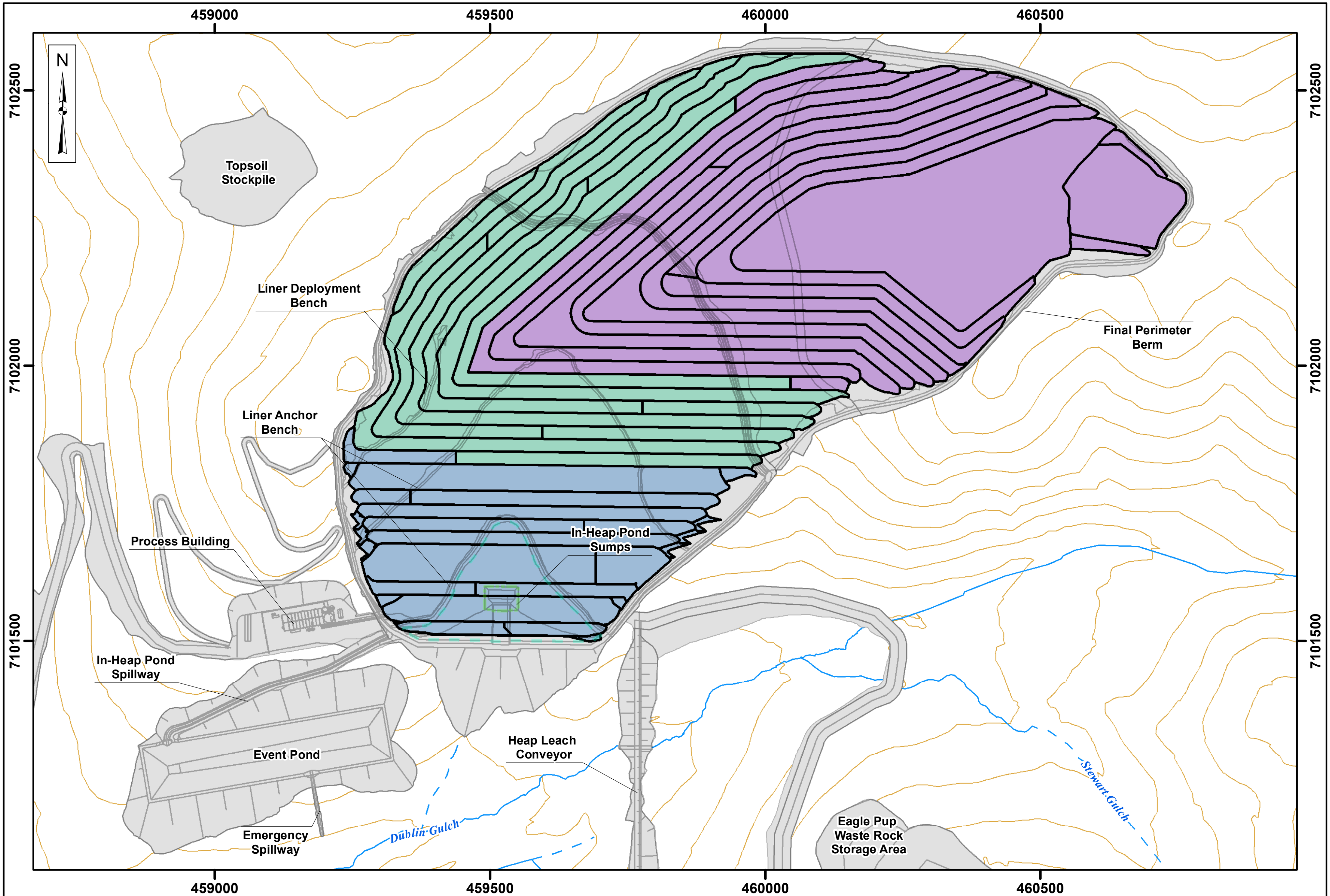
Drawn By: JK

Date: 2019/02/25

Figure: 7.2-2

EAGLE GOLD PROJECT YUKON TERRITORY

Heap Leach Facility Phase 2



Legend:

Facility	Phase 1 (Lift 1-11)	Perennial	Contour (25m)
In-Heap Pond	Phase 2 (Lift 12-17)	Ephemeral	
Sump	Phase 3 (Lift 18-29)	Intermittent	

StrataGold Corporation

0 50 100 200 Metres

Projection: NAD 83 UTM Zone 8N

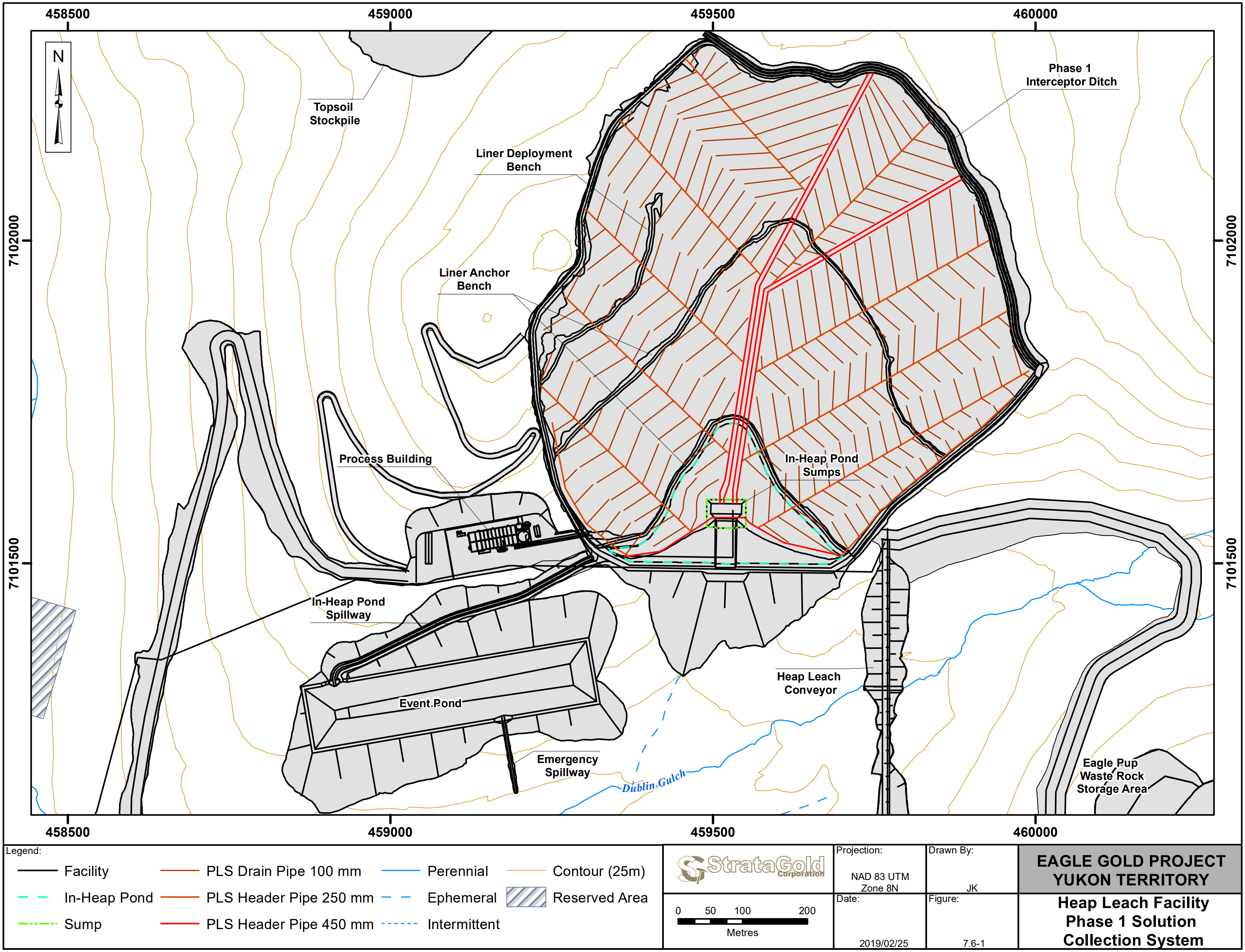
Drawn By: JK

Date: 2019/02/25

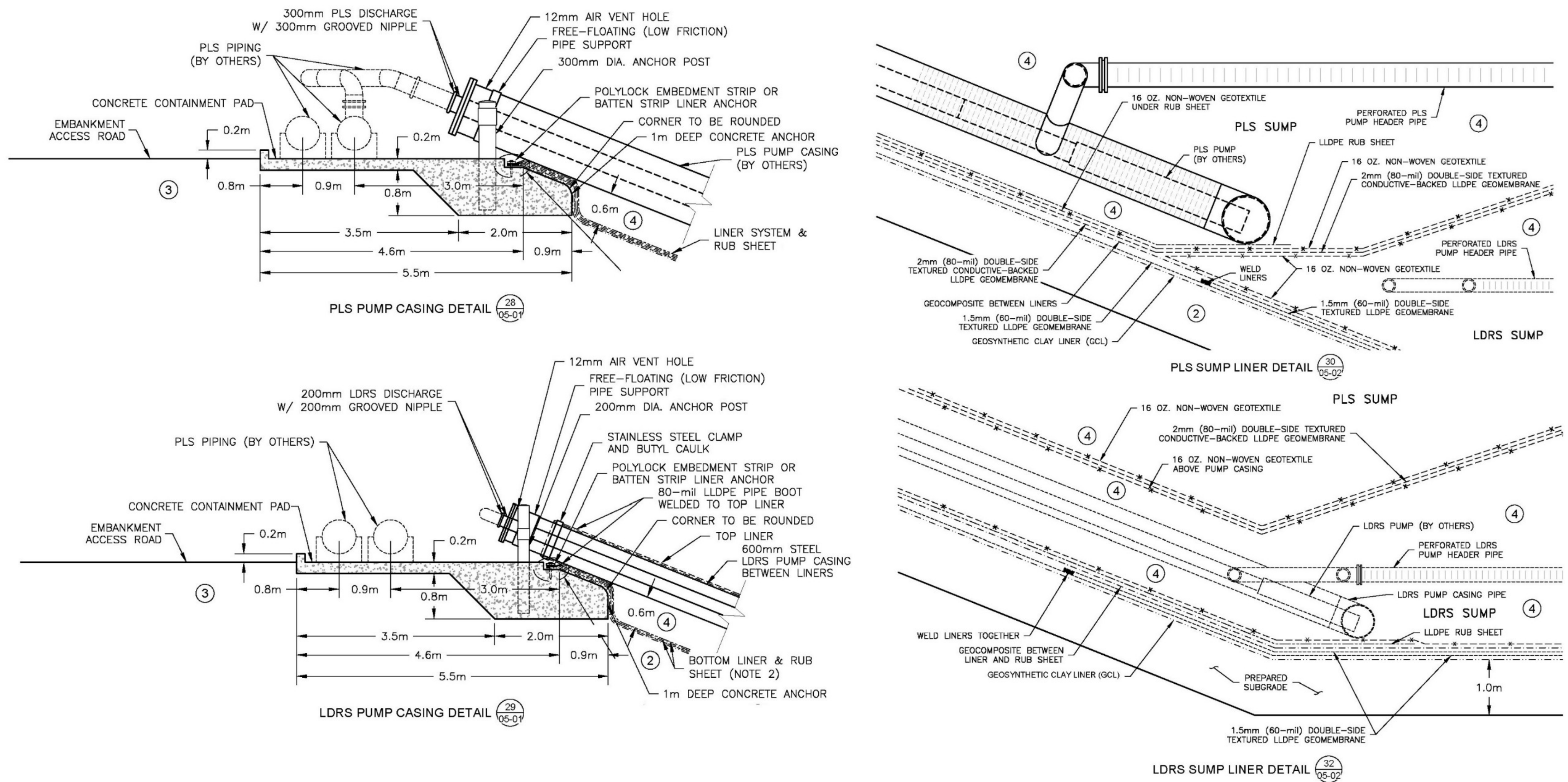
Figure: 7.2-3

EAGLE GOLD PROJECT YUKON TERRITORY

Heap Leach Facility Phase 3 (LOM)



458500
459000
459500
460000
7102000
7101500
N
Topsoil Stockpile
Liner Deployment Bench
Liner Anchor Bench
Phase 1 Interceptor Ditch
Process Building
In-Heap Pond Sumps
In-Heap Pond Spillway
Event Pond
Emergency Spillway
Dublin Gulch
Heap Leach Conveyor
Eagle Pup Waste Rock Storage Area
Legend:
Facility
In-Heap Pond
Sump
PLS Drain Pipe 100 mm
PLS Header Pipe 250 mm
PLS Header Pipe 450 mm
Perennial
Ephemeral
Intermittent
Contour (25m)
Reserved Area
StrataGold Corporation
0 50 100 200
Metres
Projection:
NAD 83 UTM Zone 8N
Drawn By:
JK
Date:
2019/02/25
Figure:
7.6-1
EAGLE GOLD PROJECT
YUKON TERRITORY
Heap Leach Facility
Phase 1 Solution
Collection System



Notes:

1. Source: BGC (2017). Drawing No. EGHLF-XD-05-04 in Eagle Gold Project Heap Leach Facility Detailed Design Report. Prepared for StrataGold Corporation November 16, 2017.
2. This Drawing may have been reduced or enlarged. All fractional scale notations indicated are based on original format drawings.

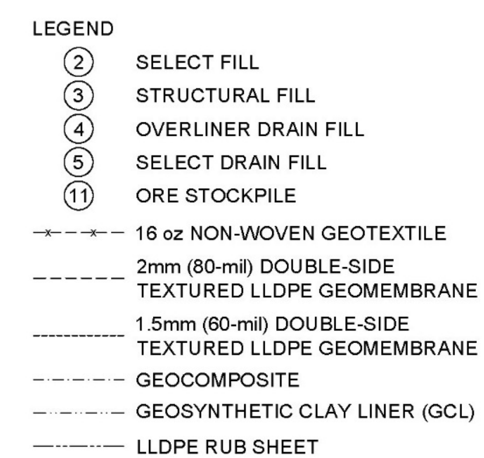


Figure 7.7-1: Heap Leach Facility PLS Sump and LDRS Detail

8 HEAP LEACH FACILITY MAINTENANCE

The purpose of the HLF Maintenance Program is to ensure the individual facility components, and the entire facility as a whole, are operating as designed. Proper HLF maintenance will provide a safe working environment for employees; maximize precious metals recovery; and minimize the potential for events that would contribute to the requirement for the institution of contingency water management measures as considered in the HLF CMWP.

Maintenance of the HLF is the responsibility of the Process Manager with support from the Maintenance Manager. The Process Operations Department will have personnel with the required qualifications to understand operating and maintenance manuals, assess conformance with HLF design or performance standards, complete routine or predictive maintenance tasks, and to adequately respond to event-driven maintenance requirements.

Figure 8.1-1 presents a general maintenance flowchart for the HLF. This flowchart presents a maintenance review process that will be applied to individual components to ensure the facility is operating as designed.

8.1 ROUTINE MAINTENANCE

HLF components requiring routine maintenance include:

- HLF embankment;
- Stacked ore pile;
- PLS recovery pumps;
- Accessible portions of the solution delivery and collection system including pipelines, drip emitters, pumps, tanks, pipeline corridors, and other support facilities;
- Conveyors and radial stacker facilities;
- Instrumentation as appropriate; and
- Events Pond.

Regular maintenance procedures for the HLF components include the following:

- Regularly inspection of the interceptor ditches and solution channels for accumulation of debris or sediment, and remove as appropriate.
- Pipeline corridors will be monitored for flows indicating leaks from pipes. Pipes will be repaired, as needed.
- Visually inspect the embankment for signs of erosion, leaks or slope movement. Repair erosion gullies, local slumps or slides in the embankment face. Report all signs of erosion, leakage or slope movement to a qualified geotechnical engineer as appropriate.
- Visually inspect the heap pile for signs of sliding, tension cracks, erosion or other signs of instability. Repair as appropriate. Slope maintenance will include any activities required to maintain the slope of the ore and preserve the integrity of structure along the toe of the slope. Report all signs of heap instability to a qualified geotechnical engineer as appropriate.
- Conduct routine inspections and maintenance of all pumps per manufacturer guidelines.
- Conduct routine inspections and maintenance of all instrumentation per manufacturer guidelines.

- Conduct routine inspections and maintenance of the conveyor systems and radial stacker per manufacturer guidelines.
- Visually inspect the visible portions of the HLF and Events Pond liners and make repairs to damaged sections as appropriate.
- Conduct routine inspections of the Events Pond. Remove any accumulated debris as appropriate. Make repairs to pond liners as appropriate. Remove any accumulated solutions, including stormwater runoff, within the specified timeframes to maintain required pond storage capacities.
- Conduct routine inspections of accessible portions of the solution delivery and collection system including pipelines, drip emitters, pumps, and tanks.
- Perform regular non-destructive testing appropriate for components of the system including periodic measurement of pipeline thickness to identify areas of wear and to schedule pipeline replacement if necessary. Replace pipe work, bends and fitting components as required. Remove accumulated debris from valves, reducers and off takes. Carry out maintenance as recommended by fitting and valve suppliers, and regularly inspect major wear components.

8.2 EVENT DRIVEN MAINTENANCE

Potential event-driven maintenance items arising from pipeline leaks or breaks, earthquakes and floods are listed below.

8.2.1 Solution Collection and Delivery System Pipeline Leaks or Breaks

- Inspect entire pipeline;
- Repair or replace affected components;
- Perform opportune and scheduled maintenance;
- Repair any collateral damage caused by a leak or break;
- Collect any released or spilled solutions and return them to the HLF fluid management system; and
- Reclaim any disturbed areas as appropriate.

8.2.2 Earthquake Occurrence

- Inspect embankment for sign of distress due to deformation;
- Inspect embankment for signs of liquefaction (e.g. local sand boils, etc.); and
- Inspect ore pile for signs of movement.

8.2.3 Flood Event

- Monitor In-Heap Pond and Events Pond fluid levels.
- Measure freeboard in both solution ponds for compliance with design requirements and the HLF CWMP.

- Inspect embankment, solution and diversion ditches for signs of excessive erosion and repair if required; and,
- Inspect solution collection and delivery system for operational adequacy.

8.3 MAINTENANCE SCHEDULE AND SPARE PARTS

All electrical and mechanical components will be inspected and maintained as per manufacturer's recommendation. A spare parts inventory will be maintained as recommended by equipment manufacturers and as required by the Owner.

8.4 DOCUMENTATION

Maintenance records of each component will be kept by the Process Plant Manager and will include:

- Up-to-date logs of in-service equipment and facilities;
- Maintenance schedules;
- Maintenance history;
- Inspection logs;
- Repair reports including cost;
- Frequency, cause of problems and planned mitigation;
- Component reliability records;
- Quality control records;
- Photographs, videos of repair issues;
- Inventory of spares, materials, tools and equipment; and
- Critical spares list.

8.5 REPORTING

A Maintenance Report will be prepared monthly, or as required, by the Process Manager or designate and will include:

- Completed work;
- Updated maintenance log and schedule;
- Progress on partially completed work that has been halted for some reason;
- Items not requiring maintenance and why;
- New items or conditions requiring maintenance;
- Problems and possible solutions for items requiring greater than expected maintenance; and
- Cause of any neglected or late maintenance.

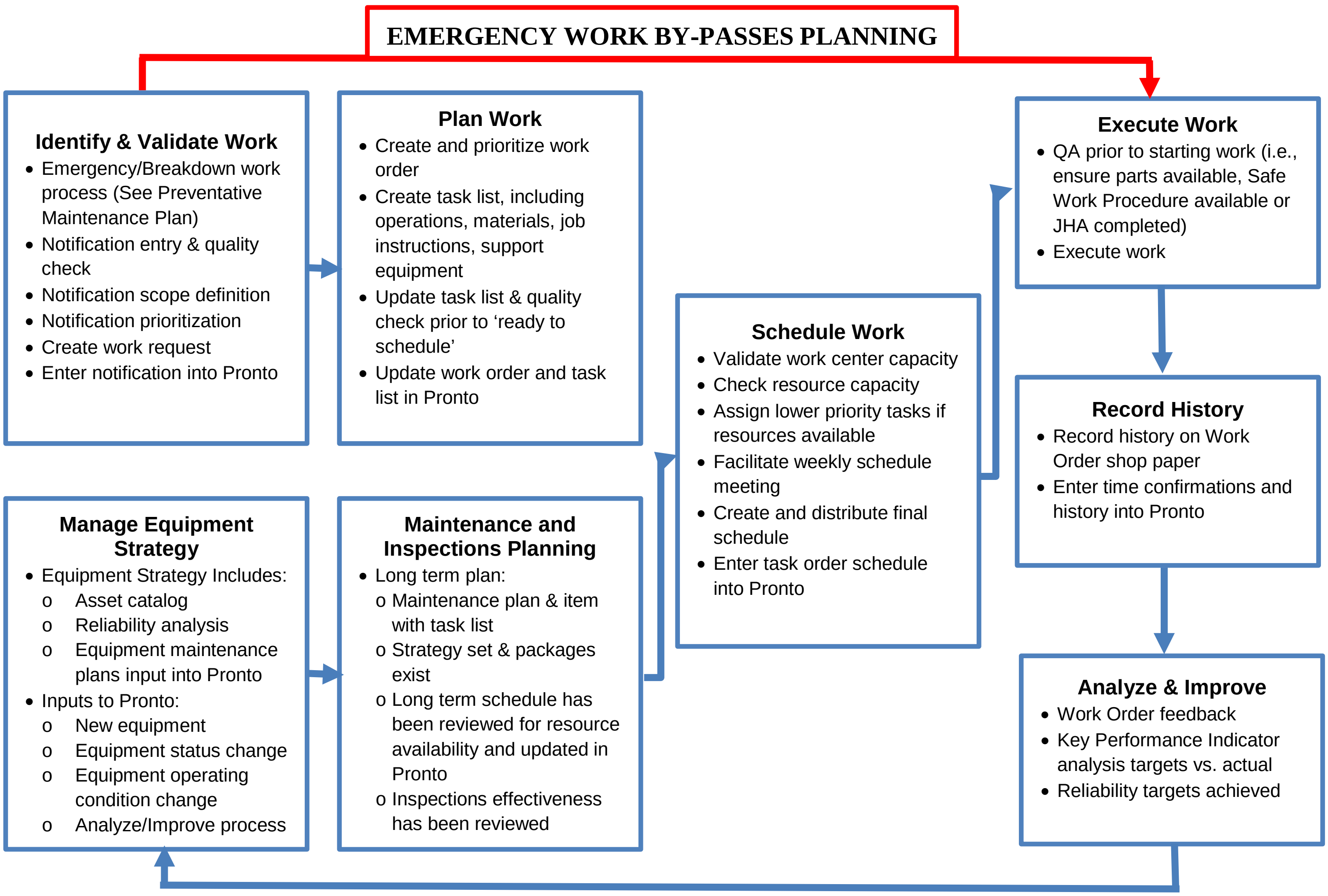


Figure 8.1-1: Heap Leach Facility Basic Maintenance Work Management Process

9 HEAP LEACH FACILITY SUVEILLANCE AND RESPONSE

Surveillance of the HLF is required to determine if the facilities are operating within expected parameters. Deviations from expected performance may require adjustments to operation, maintenance or design to facilitate ongoing safe and efficient operation of the facilities. Regular surveillance is essential to ensure ongoing safety of the HLF and to identify areas requiring maintenance before problems and safety concerns develop. Behavior and performance of the facility are assessed visually and through monitoring of instrumentation.

A flow chart of the Surveillance process is shown in Figure 9.1-1. The flowchart describes a surveillance review procedure, including an inspection program, to help ensure safe and continued operation of the HLF.

Surveillance is undertaken in two primary methods – visual inspection and reading of instruments. Results of these qualitative and quantitative observations are compared to the expected performance of the HLF. If observations are within the expected range or performance, the results of the surveillance are simply recorded. If observations are outside the expected range, further evaluation is completed to determine if remedial action is necessary. If necessary, this action is taken and may range from a minor adjustment, implementing the HLF CWMP operational procedures, or potentially the initiation of HLF Emergency Response Plan procedures, depending on the severity and nature of the deviation from expected performance.

Signs of potential or actual hazards can generally be observed by a combination of visual inspection and instrumentation readings before hazards become significant. Mine personal can identify the need for maintenance based on observations of changes to the HLF such as erosion, cracking, bulging, seeps or changes in vegetation. Additionally, changes in instrumentation readings can also indicate potential hazards.

The purpose of an inspection program is to identify problems and/or unsafe conditions that are visually evident. Visual inspections are an integral part of proper maintenance and performance of monitoring programs for the HLF. Failure to correct identified maintenance and repair items, or potential adverse behavior, could result in unsafe conditions or lead to a failure of operating systems or cause an adverse environmental effect. Table 9.1-1 summarizes the routine surveillance requirements for the HLF.

Table 9.1-1: Surveillance Requirements for the HLF

Surveillance	Frequency	Responsibility
Routine Inspection		
Embankment	Weekly by staff (Annually by Engineer)	Crushing & Conveying General Foreman or alternate
Pad Liner	Weekly	Crushing & Conveying General Foreman or alternate
Stacked leach ore for stability	Weekly	Crushing & Conveying General Foreman or alternate
Solution collection and recovery system	Weekly	Process General Foreman or alternate
Leak Detection and Collection System Monitoring Ports	Daily	Process General Foreman
Heap leach pad vibrating wire piezometers	Daily during freshet or when solution inflow and outflow rates are not equalized (i.e., application and withdrawal rates altered for operational purposes or	Process Supervisors

	equipment malfunction/upset event) weekly during the remainder of the year.	
Monitoring Vault	Weekly	Process General Foreman
Embankment geotechnical instrumentation	Weekly	Crushing & Conveying General Foreman
Events Pond fluid levels	Daily if the desired available storage has been reached and weekly otherwise.	Process Supervisors
Events Pond liners	Weekly	Process General Foreman
Conveyors and radial stacker	Monthly	Crushing & Conveying Supervisor
Geochemical sampling of leach ore	Quarterly	Metallurgist
Geochemical sampling of pregnant and barren process solution	Quarterly	Metallurgist
HLF and Dam Inspection by Engineer	Annually	Engineering of Record
Independent third-party physical stability inspection	Annually	Engineering Consultant
Event Driven Inspection	Following unusual event (e.g., heavy precipitation, freshet, earthquake)	Managers - Process, Maintenance, Health & Safety and Environmental
Comprehensive Review (Dam Safety Review)	No later than 5 years after construction and prior to decommissioning	Engineering Consultant
Instrumentation	Monthly and per Manufacturer Guidelines	Instrumentation Technician
General Visual Inspection of HLF Components and the Events Pond	Daily during the completion of standard work procedures	Environmental Manager and Coordinators and Health, Safety and Security Manager and Coordinator

If any unusual occurrences are observed during the completion of the routine surveillance activities, they will be immediately reported to the Process Manager and the Process General Foreman for assessment and development of an appropriate course of action. The Process Manager will immediately notify the Engineer of Record of any observation that has the potential to impact the stability of the HLF. If deemed necessary, appropriate procedures will be implemented as outlined in the HLF CWMP, HLF Emergency Response Plan or as directed by the Engineer of Record.

9.1 ROUTINE INSPECTIONS

Routine and/or regular visual inspections of the HLF components listed in Table 9.1-1 will be completed in accordance with required frequencies. During high water times (e.g., spring freshet, high rainfall, and flood events), daily or more frequent surveillance should be undertaken to ensure the safe operation of pumping systems and/or spillway operations. Ideally the inspections should be performed and recorded by the same person(s) to ensure that relevant incremental changes are observed between each inspection. The visual inspections will be done for all components of the HLF, including the visible portions of the leach pad liner; leach pad embankment; stacked ore pile; accessible portions of the solution delivery and collection system including pipelines, drip emitters, pumps, tanks and other support facilities; conveyors, radial stacker; the Events Pond, and instrumentation as appropriate. Records will be kept of all dam inspections and copies will be maintained on site for review during annual inspections.

Representative samples of the leached ore and the pregnant and barren solution will be sampled on a quarterly basis and analyzed for constituents as determined by the Process Manager and the Environmental Manager

The LDRS monitoring sumps will be checked daily for the presence of solution. If solutions are present, they will be sampled and analyzed for the presence of constituents as determined by the Process Manager and Environmental Manager. Contained solutions in any of the monitoring ports will be evacuated and measured for volume. All information will be recorded for comparison with follow-up measurements, and for comparison with the alert levels for the In-Heap Pond and Events Pond.

Emphasis will be placed on visual inspections of the HLF embankment. The following are items that will be looked for during these inspections:

- evidence of settlement or subsidence on the embankment crest or slope;
- evidence of cracks or erosion on the embankment slope;
- bulging on the downstream slope which could indicate leakage; and,
- evidence of animal burrows or unusual vegetation patterns on the dam.

At a minimum, monthly snowpack measurements will be made on flat and sloped surfaces of the heap leach facility, and by aspect. Each flat (leaching) surface, each slope, and each bench will be measured at a minimum of 5 locations evenly spaced throughout the pad, with an average snowpack calculated for each area. On-site weather station will be used to measure any and all rainfall, including snowfall with respective density (water content).

All observations will be formally documented.

9.2 INSTRUMENTATION, MONITORING AND RESPONSE

Construction and operational monitoring requirements for the HLF will include instrumentation for measuring phreatic levels and pore pressures within the heap, foundation and embankment; fluid levels within the heap and sumps; and movement of the embankment. Monitoring will be used to verify the facility components are performing as expected and to provide early warning of problematic conditions. Observations on the performance of the initial stages may provide useful information for optimizing subsequent stages of development.

9.2.1 Solution Head and Temperature

Vibrating Wire Piezometers will be installed in the embankment and HLF overliner as part of the initial construction.

Two pairs of vibrating wire piezometers will be located within the In-Heap Pond, one pair in the LDRS sump and one pair in the overliner layer at the base of the In-Heap Pond sump to monitor the fluid levels. The piezometers will be installed in inclined riser pipes to contain instrument lead wires for access at the dam crest.

The piezometers installed in the In-Heap Pond shall be Geokon model 4500S/SV-350kPa (or equivalent). Barometric readings are required to adjust the piezometric readings from the 4500S/SV model, therefore a barometer, such as Geokon model 4580-1, must also be installed.

Three pairs of vibrating wire piezometers will be located within the Phase 1 leach pad overliner layer upgradient of the In-Heap Pond. These piezometers shall be Geokon model 4500AL/ALV-170kPa (or equivalent) and will be installed in conduit pipes to contain instrument lead wires for access at the perimeter road.

The piezometers will provide pressure and temperature data and will be read daily during freshet and weekly during the remainder of the year to provide the water levels within the dam and ore pile. The target water levels within the In-Heap for normal operations the minimum head requirement to effectively operation the pregnant solution pumps).

Trigger levels and required actions have been established for the In-Heap pond to protect the pumping system from cavitation to ensure that the Process Manager can institute mitigative measures to ensure that the desired available storage (as further described in the HLF CWMP) is maintained at all times. The trigger levels will be programmed into an automatic alarm system in the process control center for continuous monitoring. The trigger levels will be verified by field measurement utilizing the schedule provided in Table 9.1-1:

- Condition Green: Solution level is between 912.5 and 928 m asl.
- Condition Orange: Solution level is between 912 and 912.5 m asl or between 928 and 937 m asl.
- Condition Red: Solution level is less than 912 masl or greater than 937 masl.

9.2.1.1 In-Heap Pond Trigger Level Response

To ensure that normal operating conditions are maintained, appropriate mitigative responses to solution level fluctuations have been developed as shown in Table 9.2-1. The Process Manager of designate is ultimately responsible for the institution of these responses.

Table 9.2-1: In-Heap Pond Trigger Level Responses

Condition	Solution Level (m asl)	Response
Green	912.5 to 928	• No response required. • Continue normal instrumentation monitoring
Orange	912 to 912.5	• Confirm that solution application rate and solution withdrawal rates are in equilibrium. • Reduce In-heap Pond pump out rate as necessary and as directed by Process Manager. • Increase solution application rate as necessary and as directed by Process Manager. • Increase field monitoring frequency to daily until solution level rises to normal operating level.
	928 to 937	• Confirm that solution application rate and solution withdrawal rates are in equilibrium. • Increase In-heap Pond pump out rate as necessary and as directed by Process Manager. • Maintain normal solution applicate rate at current leach area. • Inspect solution application pumping system (both operational and redundant) to ensure that increased pumping can be utilized to put solution into dynamic storage as necessary. • Consider solution application to inactive areas as necessary and as directed by Process Manager (i.e., confirm dynamic storage capability is available and utilize as necessary). • Increase field monitoring frequency to daily until solution level reduces to normal operating level.

Condition	Solution Level (m asl)	Response
		• Inspect HLF spillway on a daily basis to confirm that there are no blockages. • Measure Events Pond solution levels on daily basis to ensure that the desired available storage is available at a minimum. • Consult with the Environmental Manager regarding precipitation events either experienced or predicted. This may include out of schedule snow water equivalent measurements as necessary.
Red	>912	• Cease In-Heap Pond pump out. • Increase solution application rate as necessary and as directed by Process Manager. • Increase field monitoring frequency to hourly until solution level rises to numeral operating level.
	937 to 938	• Increase In-Heap Pond pump out rate as necessary and as directed by Process Manager. • Increase solution applicate rate at current leach area. • Initiate solution application to dry, non-active leaching portions of the pad. • Increase field monitoring frequency to hourly until solution level reduces to normal operating level. • Inspect HLF spillway on an hourly basis to confirm that there are no blockages. • Measure Events Pond solution levels on an hourly basis to ensure that the desired available storage is available at a minimum. • Inspect Events Pond spillway on a daily basis to confirm there are no blockages. • Inspect CN destruct equipment and the Mine Water Treatment Plan to ensure operability. • Inspect all backup power generation and pumping equipment on a daily basis to ensure operability. • Consult with the Environmental Manager regarding precipitation events either experienced or predicted. This may include out of schedule snow water equivalent measurements as necessary. • Confirm with the Vice President of Operations and General Manager that heavy equipment is operable and available for the excavation of an emergency downgradient events pond. • Activate HLF CWMP procedures as necessary.

9.2.2 Pond Water Levels

A level gauge will be installed in the Events Pond to allow monitoring of solution levels. The level will be monitored daily whenever solution, or direct precipitation, contained in the Events Pond has reached the desired available storage volumes, shown in Table 9.2-2, or weekly otherwise.

Table 9.2-2: Definitive Events Pond Volume Triggers

Phase	72-hour Draindown Volume (m^3)	0.5 m Freeboard Volume (m^3)	24-hour 100-year Event Volume (m^3)	Desired Available Storage Volume Required (m^3)	Percentage Full of Events Pond
1	108,000	19,300	25,200	152,500	49%
2	108,000	19,300	37,600	164,900	45%
3	108,000	19,300	54,300	181,600	39%

The Events Pond will ordinarily remain dry or occupied temporarily by direct precipitation. Any accumulation of direct precipitation will be pumped into the process circuit to reduce make up water withdrawals from other sources. As directed by the Process Manager, direct precipitation may be allowed to accumulate as this source of water represents the lowest cost source for make-up water (i.e., this source of water is significantly closer than the make-up water groundwater well and the control pond so pumping costs are reduced). For the Process Manager to permit the accumulation of direct precipitation in the Events Pond, the HLF solution condition must be green and under no circumstances can planned accumulation be above the definitive Events Pond volume triggers shown in Table 9.2-1. Additionally, planned accumulation cannot be permitted in the month prior to freshet.

Trigger levels and required actions have been established for the Events Pond to ensure that the desired available storage (as further described in the HLF CWMP) is maintained at all times. The trigger levels will be clearly marked on the Events Pond level gauge to allow for rapid visual observation of the trigger level.

- Condition Green: Fluid level is between 879.5 and 884 m asl.
- Condition Orange: Solution level is between 884 and 891 m asl.
- Condition Red: Solution level is greater than 891 masl.

9.2.2.1 Events Pond Water Level Responses

To ensure that normal operating conditions are maintained, appropriate mitigative responses to fluid level have been developed as shown in Table 9.2-3. The Process Manager of designate is ultimately responsible for the institution of these responses.

Table 9.2-3: Events Pond Trigger Level Responses

Condition	Solution Level (m asl)	Response
Green	879.5 to 884	• Events Pond has capacity to store the full volume of a Probable Maximum Flood without release. • No response required.
Orange	884 to 891	• Events Pond has capacity for the desired available storage volume regardless of HLF Phase. • Monitor fluid levels on a daily basis to ensure solution level remains within threshold.

Condition	Solution Level (m asl)	Response
		• Consult with the Environmental Manager regarding precipitation events either experienced or predicted. This may include out of schedule snow water equivalent measurements as necessary. • Inspect HLF solution application logs to confirm no increased application rates have been utilized within the expected percolation rate from the lifts under active leach. • Inspect Events Pond spillway on a daily basis to confirm that there are no blockages. • Inspect solution application pumping system (both operational and redundant) to ensure that increased pumping can be utilized to put solution into dynamic storage as necessary. • Consider solution application to inactive areas as necessary and as directed by Process Manager (i.e., confirm dynamic storage capability is available and utilize as necessary). • Confirm with the Vice President of Operations and General Manager that heavy equipment is operable and available for the excavation of an emergency downgradient events pond.
Red	>891	• Activate HLF CWMP procedures as determined by the Process Manager. • Active HLF Emergency Response Plan as determined by the Process Manager. • Measure Events Pond solution levels on an hourly basis to ensure that the desired available storage is available at a minimum. • No planned direct precipitation accumulation is permitted unless the stability of the HLF is under immediate threat. • Increase solution applicate rate at current leach area. • Initiate solution application to dry, non-active leaching portions of the pad. • Inspect Events Pond spillway on an hourly basis to confirm that there are no blockages. • Inspect CN destruct equipment and the Mine Water Treatment Plan to ensure operability. • Inspect all backup power generation and pumping equipment on a daily basis to ensure operability. • Consult with the Environmental Manager regarding precipitation events either experienced or predicted. This may include out of schedule snow water equivalent measurements as necessary.

9.2.3 LDRS Levels

A Leak Detection and Recovery System (LDRS) will be constructed within the In-Heap Pond and Event Pond and will consist of a monitoring sump equipped with an automatic, fluid-level activated pump located between the top and bottom liners. The pump will be sized to sufficiently remove fluids to minimize head on the bottom liner and collection of any potential leaks in the top liner.

The In-Heap Pond and Events Pond LDRS's monitoring sumps will be checked daily for the presence of solution. If solutions are present, they will be sampled and analyzed for the presence of *Metal and Diamond Mining Effluent Regulations* (MDMER) Schedule 4 constituents, or as determined by the Process Manager and Environmental Manager.

Two alert levels have been established for the In-Heap Pond and Events Pond. Alert Level 1 (AL1) provides a benchmark for liner performance in a double-lined pond under typical operating conditions based on industry standard rates for expected leakage from "normal" defects in the liner. AL1, as measured by the amount of fluid pumped by the pond's LDRS, is a low-level trigger that may indicate the presence of a small hole or defect in the top geomembrane. Alert Level 2 (AL2) provides a high-level trigger that indicates serious malfunction of the liner system.

9.2.3.1 HLF LDRS

Contained solutions in the HLF LDRS monitoring port will be evacuated and measured for volume. The flow meters will be monitored with alarm settings programmed in concert with the VWP measurements of In-Heap Pond levels such that an alarm is activated when either AL1 or AL2 rates, based on solution level, are pumped by the fluid level activated pumps. The HLF LDRS sump will be inspected on a daily basis to monitor fluid levels and the pumping rate of the fluid activated pump, if it has been activated. The pumping rate will then be compared to the solution levels of the In-Heap pond gathered by the VWPs and if an alert level has been reached, the mitigation measures described in the HLF Emergency Response Plan will be followed.

All information will be recorded for comparison with follow-up measurements, and for comparison with alert levels established for the In-Heap Pond. The presence of process solution in any of the ports is expected but excess volume is a potential indication of a leak in the liner.

The LDRS sump has containment capacity for approximately 10 hours of AL2 leakage assuming that the In-Pond is completely full. At the planned normal operating volume, the LDRS sump has sufficient capacity for approximately 21 days of AL2 leakage rates assuming that no intervention (including the operation of the fluid level activated pump) is undertaken.

For ease of reference, AL1 and AL2 utilizing the same In-Heap Pond levels as those presented in Table 9.2-1, are provided below in Table 9.2-4.

Table 9.2-4: In-Heap Pond Liner Leakage Trigger Level

Solution Level (m asl)	Alert Levels	
912.5 to 928	Alert Level 1	160 to 21,000 L/day
	Alert Level 2	3,300 to 420,000 L/day
928 to 937	Alert Level 1	21,000 to 69,000 L/day
	Alert Level 2	420,000 to 1,400,000 L/day
937 to 938	Alert Level 1	69,000 to 83,000 L/day
	Alert Level 2	1,400,000 to 1,700,000 L/day

The HLF Emergency Response Plan provides specific In-Heap Pond solution alert trigger levels and required responses for solution in the LDRS.

9.2.3.2 Events Pond LDRS

Contained solutions in the Events Pond LDRS monitoring port will be evacuated and measured for volume by inline flow meters. The Events Pond LDRS sump will be inspected on a daily basis to monitor fluid levels and the pumping rate of the fluid activated pump, if it has been activated. The pumping rate will then be compared to the fluid levels of the Events Pond measured by the level gauge and if an alert level has been reached, the mitigation measures described in the HLF Emergency Response Plan will be followed.

All information will be recorded for comparison with follow-up measurements, and for comparison with alert levels established for the Events Pond. The presence of process solution in any of the ports is expected but excess volume is a potential indication of a leak in the liner.

The Events Pond sump was designed to store one hour of AL2 flows so that when the geocomposite is transmitting the maximum flow the LDRS sump pumps only need to run once per hour.

The HLF Emergency Response Plan provides specific Events Pond solution alert trigger levels and required responses for abnormal conditions related to the LDRS.

9.2.4 Movement

Movement of the embankment is monitored in two ways, with survey monuments and inclinometers. A series of eight survey monuments will be located along the crest of the embankment at 50 m intervals to allow monitoring of potential movement. Survey monuments are typically used to monitor settlement and/or horizontal movements of embankments. Survey pins will be constructed with rebar embedded at least 0.8 meters into the dam surface, as needed. Since the soft material in the foundation was sub excavated and the dam fill is compacted, significant settlement or lateral movement is not expected. In addition, the current design of the dam can tolerate some movement without significantly impacting the liner or stability. Survey pins are to be installed in a straight line and visually monitored for lateral movement. This will be done as part of the routine surveillance.

Inclinometer casings will be installed through the dam after construction and prior to operations. Inclinometers allow accurate measurement of ground movement and deformation. A probe is lowered down the casing to collect data. A comparison of data over time allows evaluation of the deformation location and velocity. Inclinometers should be monitored on a quarterly basis and recorded for the annual geotechnical review.

9.2.5 Seepage and Underdrain Monitoring

The HLF underdrain system provides for the collection and drainage of subsurface water beneath the lined facility to limit upward pressure on the HLF liner. The drains will convey subsurface water to collector pipes that will discharge to an outlet monitoring vault. The vault is configured to allow for sampling of seepage flows for water quantity and quality, and will be equipped with a pump system to return flows to the HLF for use as make up water or allow flows to outfall if discharge criteria are met. In addition to providing control for groundwater seepage, the underdrain system also provides some leak monitoring capability for the upper HLF.

In the unlikely event that unplanned measurable leakage occurs from the liner system, the discharge would be identified during regular water quality monitoring of flows at the outlet monitoring vault. Separate non-perforated collection pipes for each phase of the HLF allow the outflows from each area to be monitored independently. This allows for more focused mitigation actions in the case of water quality exceedance from the underdrain monitoring system.

During operations, the seepage flow rate into the vault will be measured on a weekly basis. Water quality samples will be collected on a monthly basis and analyzed for constituents as stipulated in the WUL.

Table 9.2-1 summarizes the monitoring and frequency for operational conditions. Records of monitoring activities should be maintained and made available for the annual geotechnical review.

Table 9.2-1: Monitoring Frequency

Task	Frequency
Inspect overall HLF and Events Pond	Weekly
Measure LDRS levels at HLF and Events Pond	Daily
Measure water level at HLF In-Heap Pond	Daily
Measure pumped seepage at monitoring vault	Weekly
Measure dam and HLF pad piezometers	Monthly
Visually monitor dam crest pins	Monthly
Survey dam crest pins	Quarterly
Measure inclinometers	Quarterly

9.3 ANNUAL INSPECTIONS - ENGINEER OF RECORD OR DESIGNATE

Annual inspections are intended to be part of a more thorough review of the condition of the facility, and are carried out by a qualified engineer, experienced with the design and maintenance of the HLF. The annual inspections will be conducted by July 1st and will include the following main items:

- Visual inspection of the HLF and dam by the engineer, including taking appropriate photographs of the observed conditions;
- Review of routine inspection records prepared by operating personnel in the past year;
- Review whether or not recommendations from previous year's inspection(s) have been addressed, and any incidents or actions arising from those previous recommendations;
- Review of instrumentation and monitoring data;
- Review of the previous year's operations including reports of any incidents (and remedial measures) that may have occurred;
- An evaluation and interpretation of the structural performance of the embankment and related components, and identify any potential safety deficiencies or recommended items that need to be addressed in the coming year;
- Review construction records, QA/QC data and as-built information on dam construction and beaching; and
- Evaluation of the OMS Manual to assess the need for updating.

The results of the inspection and review will be documented in a report that will be provided to the independent third-party engineering firm engaged for the annual inspection required as per QML-0011.

9.4 ANNUAL PHYSICAL STABILITY INSPECTION - INDEPENDENT ENGINEER

As required by QML-0011, an annual inspection of the physical stability of all engineered structures, including the HLF and the Events Pond, will be conducted an independent engineer. The inspection will be undertaken by October 1st each year with a written report prepared by the independent engineer provided to Yukon Government Department of Energy, Mines and Resources within 90 days of completion of the inspection. The report will include a summary of the stability, integrity and status of all off the inspected structures, works and installation and recommendations for remedial actions made as a result of the inspection.

SGC will take immediate steps to implement any of the recommendation for remedial action made as a result of the inspection.

9.5 EVENT-DRIVEN INSPECTIONS

Special inspections will be carried out if any of the following events occur:

- Unusual events such as an earthquake or large precipitation event;
- Unusual operating events such as rupture of a pipeline or a power loss that lasts longer than 8 hours;
- Slide of the stacked leach ore;
- Unusual observations such as cracks, excessive settlements, sinkholes, large slope or foundation deformations in the embankment; or
- Instrument readings that deviate from historical trends, or are within site specific designated “alert” action levels.

Special inspections after unusual events are necessary to evaluate whether there has been any damage requiring correction, any safety measures or special operating procedures that need to be implemented, or if there is a need to initiate procedures as outlined in the HLF CWMP or the HLF Emergency Response Plan.

9.6 COMPREHENSIVE DAM SAFETY REVIEW

WUL QZ14-041 requires a dam safety review (DSR) no later than five years after construction of the HLF. The Canadian Dam Association, Dam Safety Guidelines (CDA, 2007) recommend a comprehensive DSR be carried out every 7 years during operations, prior to decommissioning and following closure. The comprehensive review provides independent verification of:

- Safety and environmental performance of the HLF, including the embankment;
- Adequacy of the surveillance program;
- Adequacy of delivery of OMS requirements;
- Design basis with respect to current standards and possible failure modes; and
- Compliance with new engineering standards (including analysis to confirm if necessary).

The DSR includes a review of the design, operation, maintenance, surveillance and emergency plan, to determine if they are safe in all respects and, if they are not, to determine required safety improvements. A DSR is a systematic evaluation of the safety of a dam, by means of comprehensive inspection of the structures, assessment of performance, and review of the original design and construction records to ensure that they meet the current criteria. Special attention should be given to those areas of design and performance having known or suspected weakness or which are crucial to dam safety. The level of detail required for a DSR should be commensurate with the importance, design conservatism and complexity of the structure, as well as with the consequences of failure. The DSR must address three fundamental components:

- The dam(s) are appropriately evaluated in terms of a thorough visual inspection, a review of salient documentation and a review of any relevant monitoring information (e.g., piezometers) as they relate to the safety of the dam(s).
- Potential failure modes for the dam(s) are recognized and tested against the available information to determine what, if any, of the candidate failure modes may be possible given the as-evaluated state of the dam(s).
- The dam(s) is provided a classification in terms of its potential for environmental impacts, economic losses, and loss of life.

9.7 DATA INTERPRETATION AND DOCUMENTATION

Documentation of surveillance activities will be maintained by the Process Manager and Environmental Manager and will include recording of:

- Routine visual observations (departures from normal conditions);
- Instrumentation monitoring and testing;
- Analyses and evaluations, including the evolution of the storage capacity of the In-Heap Pond and plots of data versus time (e.g., for level gauges, piezometer, monitoring vault readings) to examine changes over time and support HLF adaptive management decisions; and
- Reviews.

Documentation will include, as a minimum, the following:

- Routine inspection log;
- Surveillance network monitoring report
- Quarterly instrumentation reports;
- Annual engineering inspection reports;
- Biannual review of data and annual environmental monitoring and surveillance report
- Comprehensive dam safety report five years after construction of the HLF, and every seven years thereafter.

Documentation will include a hard copy (paper) and electronic filing system for inspection reports, photographic and video records, incident reports, instrumentation readings, instrumentation plots, annual inspections and third-party reviews, so that they can be quickly retrieved for review and in case of an emergency.

9.8 REPORTING

The Process Manager will review collected data records from facility monitoring and assess the need for maintenance activities or response. The reporting procedures for various levels of surveillance are summarized below.

Performance meets design expectations

Data will continue to be plotted as recorded and documented in the monthly and annual reports.

Conditions may require adjustment to design, operation, maintenance or surveillance

The results of the routine maintenance and surveillance programs may result in a caution warning that requires action. The Process Manager will formally notify the Design Engineer and request assessment of the data and to advise any remedial actions or potential modification to HLF components to bring the facility back into design expectations. The frequency of monitoring should be increased to confirm the measurements and to assess if the rate of change is increasing, stabilizing, or decreasing.

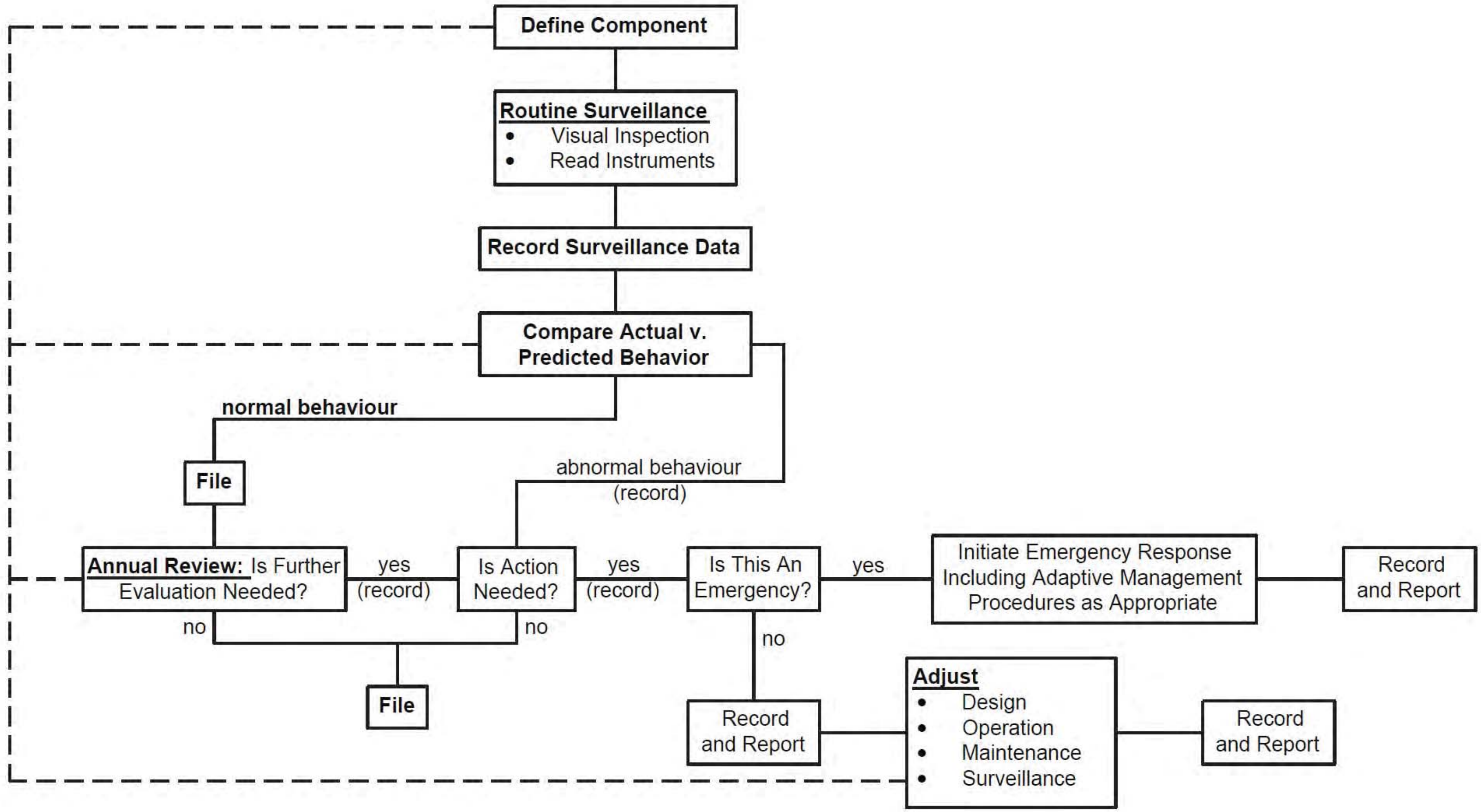
Potential Emergency Response Alert

Certain unexpected or unplanned events may trigger an emergency response alert. Examples of these events include earthquakes or large precipitation events that exceed the design storm event. The Process Manager will immediately inform the following personnel, who will determine what immediate action should be taken and whether the Emergency Response Plan should be implemented:

- Site Management including the Mine General Manager, Environmental Manager, Health, Safety and Security Manager;
- Design Engineer; and
- Yukon Government Departments (EMR, Water Resources, Environment, etc.) and Environment Canada.

Environmental Monitoring and Reporting

The Environmental Manager is responsible for overseeing sample and data collection and analysis, and reporting as per WUL requirements to the YWB and Inspector. Data acquired from all environmental programs will be compiled bi-annually, and reported annually in the QML Annual Report (due March 31st of the subsequent year). The Annual Report for the Type A Water Use License is due no later than March 31st of the subsequent year.



Notes:	StrataGold Corporation	Projection:	Drawn By:	EAGLE GOLD PROJECT YUKON TERRITORY
		Date: 2018/04/01	Figure: 9.1-1	Heap Leach Facility Surveillance Flowchart

10 REFERENCES

BCG, 2011. Eagle Gold – Geotechnical Design Basis for Mine Site Infrastructure in the Project Proposal dated. Prepared by BGC Engineering, Vancouver, British Columbia, Canada. April 2011.

BGC, 2017. StrataGold Corporation Eagle Gold Project Heap Leach Facility Detailed Design. Prepared by BCG Engineering Inc., November 16, 2017.

BGC, 2017b. In-Heap Pond and Events Pond Dam Breach Inundation Modelling; Project Memorandum from Shielan Liu, Project # 0792018, Dec 11, 2017.

Canadian Dam Association, 2007. Dam Safety Guidelines. Canadian Dam Association, Toronto, Ontario, Canada, 2007.

Canadian Dam Association, 2013. Dam Safety Guidelines. Toronto, Ontario Canada.

Canadian Dam Association, 2014. Application of dam safety guidelines to mining dams, Edmonton, Alberta, Canada

JDS Energy and Mining Inc., 2016. NI43-101 Feasibility Study Technical Report for the Eagle Gold Project. Prepared by JDS Energy and Mining Inc. for Victoria Gold Corp., Vancouver, British Columbia, Canada. September 12,2016

Lorax 2017. Eagle Gold Hydrometeorology Report. Prepared by Lorax Environmental Services Ltd., for Victoria Gold Corp., Vancouver, British Columbia, Canada. March 13, 2017.

MAC, 2011. Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities. ISBN 0-921108-25-7. The Mining Association of Canada, Ottawa, Ontario, Canada, 2011.

Stantec, 2012. Environmental Baseline Report: Climate, Eagle Gold Project, prepared March 2012.

SGC, 2014. Eagle Gold Project – Cyanide Management Plan. StrataGold Corporation, Vancouver, British Columbia, Canada. 2014.